# MACHINERY

#### DESIGN - CONSTRUCTION - OPERATION

Volume 36

AUGUST, 1930

Number 12

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Total Distribution for July, 17,048 Copies

Product Index 272-294

Advertisers Index 297-298

#### PUBLISHED MONTHLY BY

#### THE INDUSTRIAL PRESS, 140-148 LAFAYETTE STREET, NEW YORK

ALEXANDER LUCHARS, President ERIK OBERG, Editor

FRANKLIN D. JONES, Associate Editor CHARLES O. HERB, Assistant Editor

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LONDON: 52 Chancery Lane

PARIS: 15 Rue Bleue

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YEARLY SUBSCRIPTION: United States and Canada, \$3 (two years, \$5); foreign countries, \$6. Single copies, 35 cents.

Charges in address must be received fifteen days before they are to be made on our mailing list. Please send old, as well as new, address.

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# SIZE-MATIC HAS PROVED ITSELF ECONOMICAL ON SMALL LOTS

SENECA FALLS MACHINE Co. (So-swing)



Automatic Internals For production work

Universal Internals For miscellaneous Work

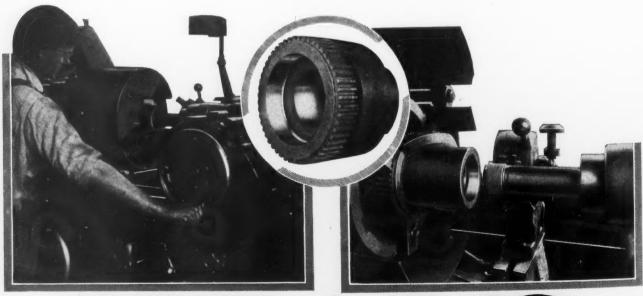
Surface Grinders
Up to 30" capacity

OVER 50 different parts are being ground internally on one Heald Size-Matic equipped with only four holding fixtures at the Seneca Falls Machine Company, makers of the Lo-Swing Lathe. The work comes to the Heald in quantities of 50 or less yet Lo-Swing says "the Size-Matic, even on small lots, is proving economical."

The impression that Heald Automatics are only adapted for high production work, such as in automotive plants, is erroneous. The fact that at least 23 machine tool manufacturers, who certainly are not mass producers, are using Heald Automatics with marked success is sufficient evidence of their ability to handle small lots at minimum cost.

The illustrations below show the Size-Matic at the Seneca Plant grinding two bores, of different diameters, in a Carriage Cross Slide Cam to a limit of .0005". Grinding these small-lot parts on a Heald saved approximately two hours over the previous method.

The Heald Machine Co., Worcester, Mass., U. S. A.



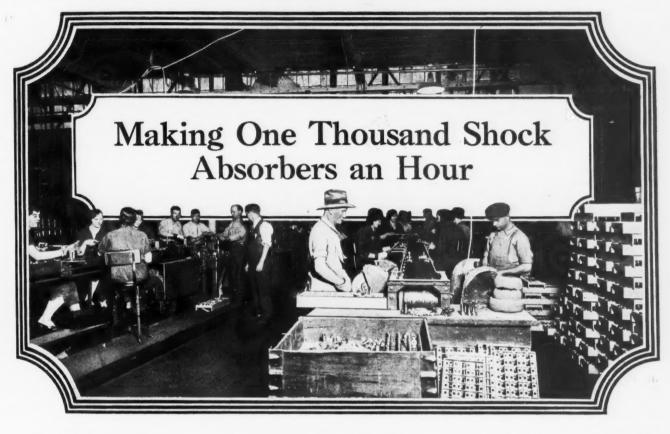
HEALD

# MACHINERY

Volume 36

NEW YORK, AUGUST, 1930

Number 12



CONCENTRATED activity along four belt conveyor lines having a total length of about 280 feet enables the Spicer Mfg. Co., Toledo, Ohio, to assemble an average of 1000 hydraulic shock absorbers per hour.

The major operations on all parts have been performed when they reach the assembly department, but it is necessary to carry out eighteen final operations and inspections on the wing and fifteen on the wing-shaft. Twenty-two steps are performed in the actual assembly of each unit.

Approximately 150 men and girls, together with machines or appliances, are closely grouped along both sides of the conveyors. This means that there is an average of one person and a machine or device for each 22 inches of conveyor length. Thus while the department is a veritable beehive of industry, there is no clogging of the aisles by work in process.

Teamwork is an Important Factor in the Efficiency of the Department

With the various important surfaces broached, milled, ground, etc., the wing and wing-shafts are delivered to the head of the two conveyor lines seen

Intensive Production Obtained in Minimum Space by Close Grouping of Equipment and Workers Along Belt Conveyors

By CHARLES O. HERB

in the heading illustration. These pieces reach the department in cast-aluminum racks such as are seen in the foreground, which are so constructed as to prevent the parts from touching one another. The wings are deliv-

ered to the conveyor at the left and the wing-shafts to the one at the right.

At the beginning of the wing line there is a fastrunning abrasive belt on which a girl holds one face of the wings to remove burrs. She then places the parts on a belt conveyor which carries them past six girls seated on stools in front of fixtures attached to the table over which the conveyor runs. These girls are equipped with files for removing the remaining burrs while the parts are held in the fixtures.

The conveyor ends with the last girl, the wings being dropped on a table having three small fixtures in which the work is held while it is being faced by hand. Three men are engaged on this operation. In the same way, equipment is duplicated or triplicated on both sides of the line for its entire length; consequently, teamwork is an important factor in attaining efficiency of the department. After the parts have been faced as men-

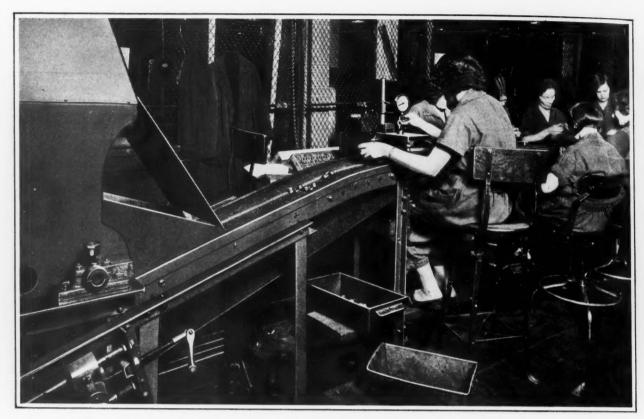


Fig. 1. A Washing Machine Delivers the Shock Absorber Wings to a Conveyor which Carries them past a Group of Girls who Inspect All Important Dimensions

tioned, they are dropped on the metal belt of a washing machine, which delivers them, cleansed of all dirt and grease, to the conveyor belt seen in Fig. 1.

Thorough Inspection Eliminates All Defective Parts

The parts are then carried to a group of nine girls provided with dial gages, snap gages, microm-

eters, etc., who check all dimensions. Various driling operations are next performed with machines of the sensitive type, burrs from the drilling operations are removed, and then the parts are passed through a second washing machine. question might here be raised as to why the drilling operations are not performed before the first washing and the inspection. The reason is that this practice avoids drilling on parts that fail to pass inspection.

From the second washing machine, the wings are delivered to girls who manipulate the two footoperated presses seen at the left in Fig. 3, and then to the girls in the

foreground of this illustration. These girls perform a final inspection, and then place the wings in baskets on an overhead conveyor which carries them to the final assembly lines. Right- and left-hand wings come down the line mixed, but they are sorted out here, the left-hand wings being placed in the white baskets while the right-hand wings are put in the black baskets.

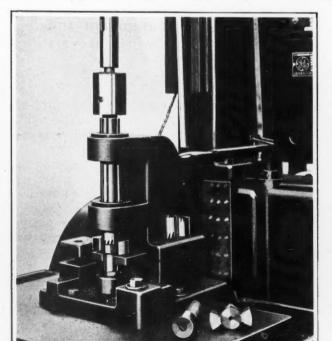


Fig. 2. A Single-spindle Drilling Machine along the Wing-shaft Line which Performs a Facing Operation

#### Activities Along the Wing-shaft Line

Returning now to the beginning of the wingshaft line, it will be seen from the heading illustration that the first operation consists of removing burrs by applying the parts to small floor-stand grinders. Then the parts are carried by the conveyor past a group of girls who remove any additional burrs with files, after which the parts reach two single-spindle machines equipped for spotfacing one surface, as shown in Fig. 2.

Next the work passes to two four-spindle drilling machines of the type illustrated in Fig. 4,

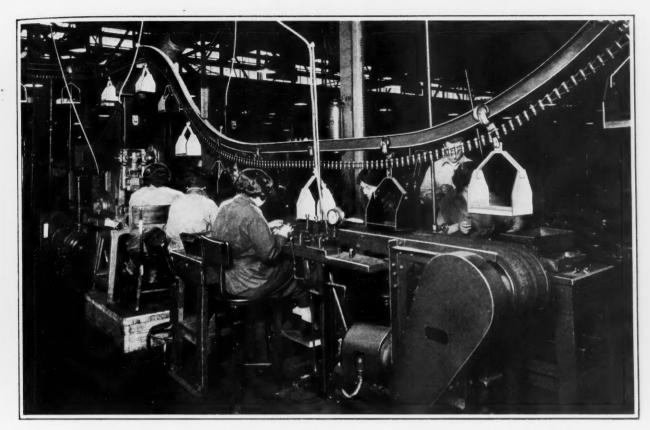


Fig. 3. End of the Wing Line, Showing a Group of Inspectors who Place the Parts in Baskets by which they are Conveyed to the Main Assembly Lines

located on opposite sides of the conveyor belt, where four small holes are drilled in it at different angles. Four single-spindle drilling machines equipped with double-spindle heads are also located at this point for performing the same operation. The parts are next carried past several portable electric drills suspended above the conveyor, as shown in Fig. 5, which chamfer the holes just drilled and remove the burrs.

After all the chips have been cleaned from the

drilled holes and the burrs removed, the wing-shafts reach the horizontal abrasive belt illustrated in Fig. 6 which removes any remaining burrs from the face. The wingshafts have now been completely finished and are passed through a washing machine. They finally reach a group of inspectors corresponding to those in Fig. 3, who check all dimensions and separate the rightand left-hand wingshafts, placing them in black and white baskets of a second

conveyor. The length of the wing and wing-shaft finishing lines is about 60 feet.

#### Two Assembly Lines for Right- and Left-Hand Parts

Two main assembly lines, one for right-hand and the other for left-hand wings, extend through the shop parallel to the wing and wing-shaft finishing lines. The overhead basket conveyors which carry the finished wings and wing-shafts away from their respective lines rise to a height of 8 or 10 feet,

meet each other, and then run side by side, first to one main assembly line and then to the second main assembly line, which is about 10 feet to the right. The black baskets are emptied at one main assembly line and the white baskets at the other.

#### Some of the Operations Along the Main Assembly Lines

The operations performed along the two main assembly lines are identical. First, there are three men who match wings and

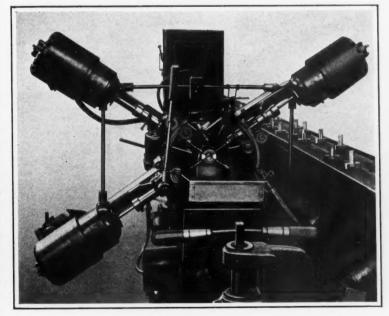


Fig. 4. Four-spindle Drilling Machine in which Four Smalldiameter Holes are Drilled in the Wing-shafts



Fig. 5. Electric Drill Suspended Above the Conveyor for Performing a Chamfering Operation

wing-shafts together, making certain that the mated parts work freely and fit as required. Then the wing is fitted into a reservoir part by means of a hand-operated arbor press, one of these presses being installed on each side of the line. The girls who operate these presses place the units on a belt conveyor which starts at this point and runs the length of the assembly line.

As the units are carried along the assembly line



Fig. 6. Small Abrasive Belt Machine which Removes Burrs from the Face of Wing-shafts

by this conveyor, a variety of operations are performed. For instance, air-operated presses are employed to force the wing against a seat of the reservoir within 0.001 inch, and this operation is inspected. Several drilling operations are next performed, dowel-pins are driven into place, the wing is reamed to fit the wing-shaft, and the latter is faced. The wing-shaft is then carefully fitted into the wing and reservoir, after which the flange

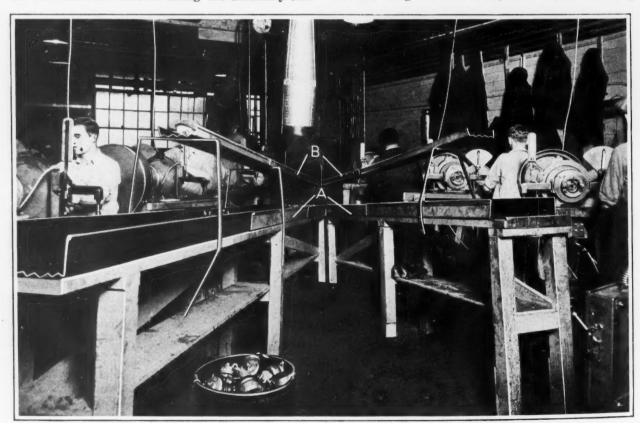


Fig. 7. Group of Testing Machines which Subject the Shock Absorbers to Loads Similar to Those They Will Meet when Installed on Automobiles

is tried on the unit with a hand wrench, and an inspection is performed to see that the shaft works freely.

Several other drilling operations are next performed; vent plugs, balls, and pins are assembled; and then the flange is permanently placed on the unit and tightened to the required degree. Next the unit is temporarily filled with glycerine, and a rubber gasket is fitted under the cover, after which a valve is assembled by the application of an air wrench. A hand test follows to determine if the shock absorber has the required amount of resistance. Then the cover is driven tight against a graphite gasket by power, and after the cover ring

The Tested Units are Washed and Then Painted Automatically

The operators of the testing machines place the inspected units in overhead troughs B, Fig. 7, which carry them into a washing machine, the right- and left-hand units meeting here for the first time. As they leave the washing machine, one man dries them thoroughly with air equipment, and a second man places them on the vertical spindles of the machine shown at the left in Fig. 8. These vertical spindles are stationary with regard to their own axes as they are carried in a circular path around the machine until they approach a certain point, when they start to rotate rapidly. "Duco"

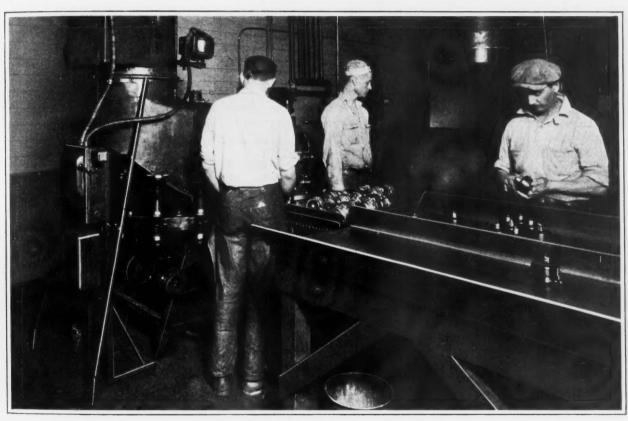


Fig. 8. Washing, Drying, and Painting Machines which Prepare the Shock Absorbers for the Final Visual Inspection and Boxing for Shipment

has been drawn up, the unit is permanently filled with glycerine.

Severe Final Tests are Given the Assembled Units

After several more assembly operations, the complete units are placed in troughs A, Fig. 7, beside which are testing machines in which the shock absorbers are subjected to loads corresponding to those that they will have to withstand in service. In these tests, the units must be free in one direction and yet withstand a pressure of 1800 pounds in the other direction. It is important that the shock absorbers work freely, and yet they must not be loose enough to allow leakage of the glycerine. In other words, the manufacture of these parts constitutes precision work carried out on a production basis. Thermometers are provided on the machines for checking the temperature of the room and of the glycerine.

is then sprayed on the units automatically as they pass two air guns, after which the rotation of the work-holding spindles again ceases.

When the painted units are taken from this equipment, they are placed on the table seen at the right in Fig. 8, the right-hand units again being separated from the left-hand ones. They are then given a visual inspection and boxed for shipment. Each main assembly line is approximately 80 feet long.

Production in this department is varied to meet requirements, but it generally ranges between 800 and 1000 shock absorbers per hour. When the lower rate is sufficient to meet market requirements, some of the employes along the line are dispensed with, and when a higher production is necessary, they are re-installed. The arrangement of duplicate and triplicate machines for the same operations makes this flexibility possible.

# The Shop Executive and His Job

Superintendents and Foremen are Invited to Exchange Ideas on Problems of Shop Management and Employe Relations

"The machine shop industries are

wasting more time and money

through drawings not being dimen-

sioned with proper tolerances than

through any other cause," said the

superintendent of a large manufac-

cially true in jobbing shops and in

shops making a variety of products.

The production shops generally work

to carefully predetermined limits of

accuracy." Superintendents and fore-

men are invited to discuss this matter

in MACHINERY, giving specific exam-

ples of waste of time and effort

caused by tolerances not being given

on drawings, or by being set so close

that the work must be done with a

degree of accuracy that serves no

useful purpose. The subject of proper

tolerances is of the greatest impor-

tance in the machinery industries.

turing plant recently.

#### **ENCOURAGING SUGGESTIONS**

The editorial on page 858 of July Machinery, deals with a subject that is of considerable importance in establishing friendly relations in industry. Suggestion systems, properly handled, are of great value; but, unfortunately, many systems of this kind have been installed and maintained without sufficient care and thought.

Sometimes the value of suggestions can only be determined by a try-out. In this way, suggestions that may appear to be very good at first sight are sometimes shown to have little or no value, while those that may appear to have few advantages prove to be very valuable when put into practice.

In one shop where awards for suggestions are made, any employe below the rank of superintendent may receive an award; but employes whose work consists of devising ways and means of reducing costs, like tool designers and equipment engineers, are not entitled to awards, because they are actually employed and paid for making suggestions, and new ideas are expected from them in the regular course of their employment.

Foremen do not receive an award for ideas that they can apply in their department by their own authority; they receive an award only when the idea proposed is of such a character that it cannot be applied except by the approval of a higher executive.

The awards for suggestions, in the case of one company, vary from a comparatively small sum of money up to one thousand dollars. The results are said to have been highly satisfactory.

**OBSERVER** 

#### SHOULD VERBAL ORDERS BE ACCEPTED?

It is a principle of good management that all instructions as to how work is to be performed and all reports as to how orders have been executed must be printed or written. This makes it possible to preserve records of all instructions and reports for future reference and it enables errors to be traced and responsibility to be placed where it belongs.

Written orders and reports are necessary, because few of us can give directions that are always clear, and fewer still can be depended upon always to understand oral instructions perfectly. Verbal directions or reports that are transmitted several times from one person to another almost invariably gain or lose something in their transmission. Therefore, any shop executive will find it to his advantage to write down instructions or orders that are delivered to him orally.

Philadelphia, Pa.

"This is espe-

JOSEPH BELL

#### SUGGESTED SHOP RULES

I would like to contribute to the discussion of shop rules some of the rules used in a Boston machine shop. All employes are allowed five minutes

before quitting at noon and night in which to clean up around their machines or benches, and if the cleaning up is done properly in less than five minutes, they are allowed the remainder of the time to wash up. There is a periodic check-up to see that the time allowance is not abused and that the machines are cared for properly.

Any employe punching the time-clock one minute late is docked fifteen minutes; and, if he is sixteen minutes late, he is docked half an hour. The reason for this is that the men punch the time-clock on the way in, and are not ready to go to work at the time they punch the clock; they must change their clothes, get their tools, etc., so that the rule is not so drastic a

penalty as it might seem. It is simply a protection against paying for time that is not spent on the company's work.

If a man is on time every day for four consecutive weeks, he is paid a bonus of 3 per cent of his four weeks' earnings, whether a day or a piece worker. The four weeks' record for being on time may start any day in the month.

This plan has worked out very well, and since it was put into operation, there has been very little tardiness. The amount paid out in bonuses is much smaller than the cost of having the men late and holding up production; yet, the earnings of the men have increased.

Boston, Mass. CHARLES R. WHITEHOUSE

[The question of a bonus being paid for punctuality is one on which opinions differ. Brief comments on this subject are invited.—EDITOR]

#### BONUS FOR BEGINNING WORK ON TIME

Consistent punctuality promotes discipline, reliability, and also confidence. For this rarity there should be a prize. For example, when finishing high school, my son received a medal for not having been tardy or absent for six years. For a record like that, recognition is proper.

Ordinarily, however, I believe that the men in a shop should be penalized for being late rather than given a bonus for coming in on time. A foreman does not show himself capable of filling his job if he is unable to handle men without additional expense to the company; therefore, a bonus for beginning work on time is unsatisfactory in principle, and should not be encouraged in industry.

ALFRED VAKSDAL

#### SHOULD WAGES BE BASED UPON DEPEND-ABILITY OR PRODUCTION?

Forty years' experience as a machinist and foreman leads me to state that the dependable man is one of the most valuable assets to any company. In my opinion, dependability should be recognized in the pay envelope. This is especially true in a shop where many different intricate articles are manufactured or where unusual problems are encountered. The man who can do work of this kind successfully with a minimum of supervision is a valuable asset. Generally, the dependable man is taken too much for granted, and is appreciated only after he has gone elsewhere.

A man of this type usually is sufficiently interested in his work to have new ideas and suggestions for improvements. By experience and training, he is fitted to solve new problems; and in addition to what he receives in wages as a mere producer, he is entitled to consideration because of his dependability in the case of an emergency. A. EYLES

#### POSTING SALESMEN ON CHANGES IN DESIGN

Salesmen should be informed immediately by some systematic method of any changes made in the products they are handling. This can be done by a clerk who has an accurate record of all changes made in the products manufactured by the company. This record, with all products classified according to types, should be kept strictly up to date, and copies of each product should be kept at hand ready for instant reference.

The clerk should have a list containing the names of all employes who receive drawings or blueprints, and who should be notified when corrections or changes are made. Notices of changes should be sent to all salesmen and other members of the organization interested in the product involved.

A copy of the corrected drawing of the product and instructions to destroy the old drawing should be sent out with each notice of a change. With this system, there will be little chance of a buyer's receiving incorrect information. Also, much of the delay and trouble incident to making sales will be eliminated.

HARRY KAUFMAN

#### INTERVIEWING MEN TO BE HIRED

I am in full accord with the ideas expressed on page 593 of April Machinery regarding the interviewing of men, but would like to go a step further. A man claiming years of experience as a toolmaker in one organization may not have as much real experience as a machinist may have had in another. Experience is too often measured by the yardstick of years and the name of the trade, when actually it is what the man knows and can do that counts.

While an employment manager cannot be a master of all trades, he can formulate a number of questions in cooperation with the foremen, which may aid in gaging the real experience of the ap-Such questions should be asked not so much with a view to obtaining a correct or complete answer, but rather as a means of studying the alertness and the attitude of the man interviewed. For example, a machinist might be asked how he would set up a certain job shown on a blueprint, and the sequence in which he would do the various operations, as well as what tools and machines he would use. His confidence in answering the questions, and the kind of questions he would ask regarding the available equipment, would greatly aid in appraising his understanding of shop practice.

If the applicant were a draftsman, a few simple but fundamental questions on mechanics or strength of materials would suit the purpose. By carefully checking his own impressions with the foreman's opinion of a man after he has been at work for some time, an intelligent employment manager would soon be able to work out a valuable standard for rating applicants.

JOHN F. HARDECKER

### THE POWER PLANT IS NOT THE ONLY PLACE TO REDUCE POWER COSTS

When a general manager starts a campaign to save power costs, he generally thinks of the coal bill and his attention is turned to the power plant. However, there is often greater waste in the transmission than in the generation of power. One of the important places for saving power costs is in the transmission equipment. Belts, gears, speed reducers, and silent chains may have a very high efficiency when first installed, but unless everything is kept in first-class condition, the efficiency will not be so high a few years after the installation. Equipment that has shown 98 per cent efficiency when first installed, by actual tests has revealed a power loss of 15 per cent after a few years.

It is an unfortunate fact that in some plants the production and engineering departments do not work in close cooperation; this makes it difficult to change equipment or methods so that a series, of small savings in power consumption can be effected. Metering the power to every department and charging each department for the power used has been proposed as an effective way of obtaining cooperation, for it makes the production department actually seek the aid of the engineering department in power cost reduction.

M. Buswell

# Modern Grinding Methods in Railroad Shops

Last of Three Articles Dealing with the Grinding of Locomotive Parts— The Present Installment Deals with Locomotive Crankpin Grinding

By H. H. MOOR, Micro Machine Co., Bettendorf, Iowa

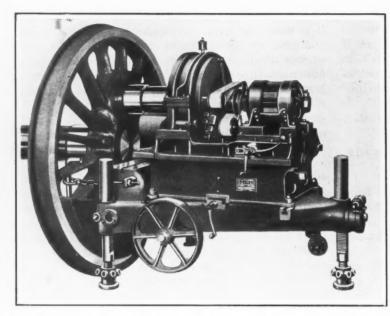


Fig. 23. Ready to Grind the Crankpin of a Locomotive Driving Wheel with a Portable Crankpin Grinder

In the past, when locomotive crankpins had to be trued up, they were generally removed from the driving wheels, or attempts were made to true the pin by hand-filing. The former method resulted in long engine delay at terminal points; the latter was very crude and not very satisfactory from the point of view of accuracy. The introduc-

tion of the portable locomotive crankpin grinder built by the Micro Machine Co. has made it possible to grind the crankpins with the wheels still under the locomotive, or with the wheels removed from the engine, but the crankpin not removed from the wheel.

As shown in Fig. 23, the machine is rolled up to the wheel and raised to the approximate height of the pin center by three elevating jacks, operated in unison from one point by a hand-crank. The machine is squared up with the wheel by drawing the machine against the hub face of the driving wheel with the anchoring chains, as indicated. The final centering is accomplished through the use of a centering spider, as shown in Fig. 24. This spider is removed after the set-up has been made. It will be noted that a needle pointer is provided to swing over the end of the eccentric crank bearing to insure concentricity of the rod bearings with the eccentric crank bearing.

The grinding is done by the use of a wide-faced wheel which covers the entire length of the pin bearing. The grinding spindle is mounted eccentrically for feeding the wheel to the crankpin. The depth of cut may be increased while the main bearing revolves by means of an automatic feed mechanism operated from a hand-knob on the machine.

In addition to going around the pin, the grinding wheel oscillates longitudinally approximately 3/4 inch, so that the path of the grinding wheel is changed every 1 1/3 revolutions. This oscillating movement insures straight and round grinding. It keeps the grinding wheels sharp and eliminates the possibility of hollow grinding because of wheel wear. By the use of grinding wheels of different diameters, the machine will grind pins ranging from 4 to 10 inches in diameters in diameters.

eter. The driving motor furnishes both planetary and longitudinal movements to the grinding wheels.

Both steps of a main pin out of round as much as 1/16 inch can be finished in two hours, or less, including the set-up time. Single-step or side-rod pins are finished regularly in about one hour.

Fig. 25 shows the machine in operation on the



Fig. 24. The Centering Spider is Removed after the Machine has been Adjusted to the Pin Circumference

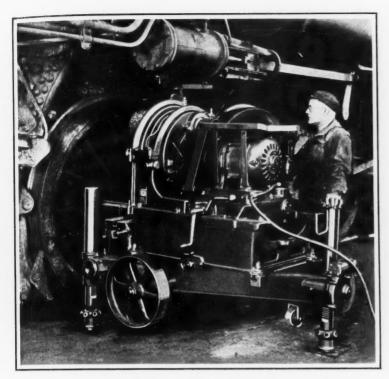


Fig. 25. Crankpin Grinder Reconditioning Worn Pins in a Midwestern Railroad Shop

erecting floor in a midwestern railroad shop. On this road, the crankpin wear is unusually great because of exceptionally heavy freight haulage. In this case, therefore, the use of a portable crankpin grinder has proved especially advantageous.

### MULTIPLE-TOOTH TOOL USED FOR RAPID THREADING IN A LATHE

Small flanges are threaded to an outside diameter of 2 7/8 inches (twenty threads per inch) at the

rate of 190 pieces per hour by the use of the equipment shown in the illustration. These threads must pass a rigid inspection, because the part is used in hydraulic shock absorbers and there must be no leakage of the fluid past the threads. In the same operation in which the threads are cut, a piloting surface in front of the threaded surface is turned to between 2.809 and 2.810 inches. The threaded surface is 7/32 inch wide, while the width of the piloting surface is 5/32 inch.

This operation is typical of many performed in the shock absorber department of the Spicer Mfg. Co., Toledo, Ohio, in producing accurate work at a high rate of output. For the operation, the previously finished hole at the center of the part is seated on an arbor connected to an air chuck. The C-washer A holds the part to the arbor.

When the operation is started, toolblock B holding the cutter that turns the pilot, moves toward the right, even though the carriage on which it is mounted feeds toward the left. This movement of the tool-holder is accomplished through a cam arrangement. The turning tool finishes its cut before the threading commences.

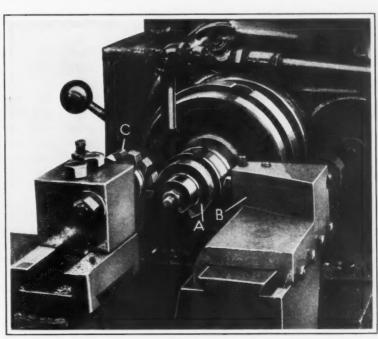
Attention is called particularly to the design of the multiple-tooth tool C employed for cutting the threads as the carriage completes its movement toward the headstock. This tool has twelve series of cutting edges, so that as one series becomes worn, the tool can be indexed to bring another series into position for use. By this construction, unusually long life between resharpenings of the tool is obtained.

#### THE WORLD IS GROWING SMALLER

The other day the Director General of the Chilean State Railways in South America picked up his telephone in Santiago, Chile, was connected with the New York City office of the Westinghouse Electric & Mfg. Co., and ordered, over the 'phone, four express passenger locomotives to a value of about \$500,000. The

whole transaction was accomplished in a few minutes. If carried on by mail, it would have involved a delay of months.

According to the National Automobile Chamber of Commerce, 366 Madison Ave., New York City, the production of pleasure cars and trucks in June reached a total of 343,000. The production during the first six months of the year was 2,322,200 cars and trucks.



Cutting Threads on Parts at the Rate of 190 Pieces per Hour with a Multiple-tooth Threading Tool in a Lathe

# Modern Grinding Methods in Railroad Shops

Last of Three Articles Dealing with the Grinding of Locomotive Parts – The Present Installment Deals with Locomotive Crankpin Grinding

By H. H. MOOR, Micro Machine Co., Bettendorf, Iowa

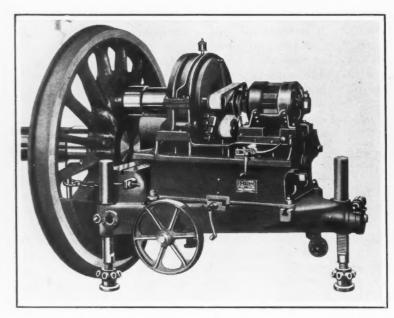


Fig. 23. Ready to Grind the Crankpin of a Locomotive Driving Wheel with a Portable Crankpin Grinder

In the past, when locomotive crankpins had to be trued up, they were generally removed from the driving wheels, or attempts were made to true the pin by hand-filing. The former method resulted in long engine delay at terminal points; the latter was very crude and not very satisfactory from the point of view of accuracy. The introduc-

tion of the portable locomotive crankpin grinder built by the Micro Machine Co. has made it possible to grind the crankpins with the wheels still under the locomotive, or with the wheels removed from the engine, but the crankpin not removed from the wheel.

As shown in Fig. 23, the machine is rolled up to the wheel and raised to the approximate height of the pin center by three elevating jacks, operated in unison from one point by a hand-crank. The machine is squared up with the wheel by drawing the machine against the hub face of the driving wheel with the anchoring chains, as indicated. The final centering is accomplished through the use of a centering spider, as shown in Fig. 24. This spider is removed after the set-up has been made. It will be noted that a needle pointer is provided to swing over the end of the eccentric crank bearing to insure concentricity of the rod bearings with the eccentric crank bearing.

The grinding is done by the use of a wide-faced wheel which covers the entire length of the pin bearing. The grinding spindle is mounted eccentrically for feeding the wheel to the crankpin. The depth of cut may be increased while the main bearing revolves by means of an automatic feed mechanism operated from a hand-knob on the machine.

In addition to going around the pin, the grinding wheel oscillates longitudinally approximately 3/4 inch, so that the path of the grinding wheel is changed every 1 1/3 revolutions. This oscillating movement insures straight and round grinding. It keeps the grinding wheels sharp and eliminates the possibility of hollow grinding because of wheel wear. By the use of grinding wheels of different diameters, the machine will grind pins ranging from 4 to 10 inches in diam-

eter. The driving motor furnishes both planetary and longitudinal movements to the grinding wheels.

Both steps of a main pin out of round as much as 1/16 inch can be finished in two hours, or less, including the set-up time. Single-step or side-rod pins are finished regularly in about one hour.

Fig. 25 shows the machine in operation on the



Fig. 24. The Centering Spider is Removed after the Machine has been Adjusted to the Pin Circumference

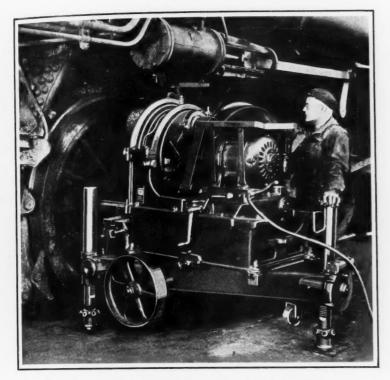


Fig. 25. Crankpin Grinder Reconditioning Worn Pins in a Midwestern Railroad Shop

erecting floor in a midwestern railroad shop. On this road, the crankpin wear is unusually great because of exceptionally heavy freight haulage. In this case, therefore, the use of a portable crankpin grinder has proved especially advantageous.

# MULTIPLE-TOOTH TOOL USED FOR RAPID THREADING IN A LATHE

Small flanges are threaded to an outside diameter of 2 7/8 inches (twenty threads per inch) at the

rate of 190 pieces per hour by the use of the equipment shown in the illustration. These threads must pass a rigid inspection, because the part is used in hydraulic shock absorbers and there must be no leakage of the fluid past the threads. In the same operation in which the threads are cut, a piloting surface in front of the threaded surface is turned to between 2.809 and 2.810 inches. The threaded surface is 7/32 inch wide, while the width of the piloting surface is 5/32 inch.

This operation is typical of many performed in the shock absorber department of the Spicer Mfg. Co., Toledo, Ohio, in producing accurate work at a high rate of output. For the operation, the previously finished hole at the center of the part is seated on an arbor connected to an air chuck. The C-washer A holds the part to the arbor.

When the operation is started, toolblock B holding the cutter that turns the pilot, moves toward the right, even though the carriage on which it is mounted feeds toward the left. This movement of the tool-holder is accomplished through a cam arrangement. The turning tool finishes its cut before the threading commences.

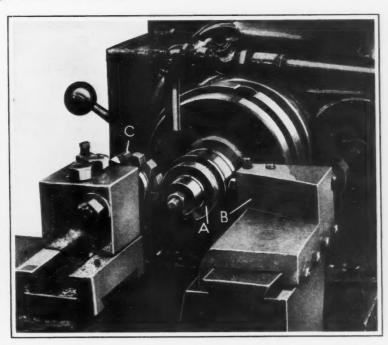
Attention is called particularly to the design of the multiple-tooth tool C employed for cutting the threads as the carriage completes its movement toward the headstock. This tool has twelve series of cutting edges, so that as one series becomes worn, the tool can be indexed to bring another series into position for use. By this construction, unusually long life between resharpenings of the tool is obtained.

#### THE WORLD IS GROWING SMALLER

The other day the Director General of the Chilean State Railways in South America picked up his telephone in Santiago, Chile, was connected with the New York City office of the Westinghouse Electric & Mfg. Co., and ordered, over the 'phone, four express passenger locomotives to a value of about \$500,000. The

whole transaction was accomplished in a few minutes. If carried on by mail, it would have involved a delay of months.

According to the National Automobile Chamber of Commerce, 366 Madison Ave., New York City, the production of pleasure cars and trucks in June reached a total of 343,000. The production during the first six months of the year was 2,322,200 cars and trucks.



Cutting Threads on Parts at the Rate of 190 Pieces per Hour with a Multiple-tooth Threading Tool in a Lathe

# A Successful Bonus System in the Tool-room

How the Bonus System was Applied to Tool-room Work with Advantage Both to the Employer and to the Employe

By WILLIAM C. BETZ, Master Mechanic, Fafnir Bearing Co.

A LITTLE over six years ago a bonus system was introduced in the tool-room of the Fafnir Bearing Co., New Britain, Conn. Under this system the average earnings of the men have been increased approximately 20 per cent and there has been a gain in production of at least 30 per cent. The bonus rates were set to give a fairly fast toolmaker an increase of about 30 per cent over his regular day rate. The day or hourly rates correspond as nearly as possible with the prevailing rates in other tool-rooms in the same locality. The rates vary, of course, in accordance with the individual qualifications of the men.

#### Determining the Amount of the Bonus

Basically, the system consists of paying the employe his regular day or hourly rate for all time saved over the time allowed for the job, in addition to his regular wage. For example, if the time allowed on a certain job is 30 hours and the man does the work in 25 hours, he is credited with 30 hours time for which he is paid at his regular hourly rate. In other words, he is paid for 30 hours work, although he actually worked only 25 hours on the job.

In case a man takes more time than that set on a job, he is paid for the number of hours worked at his regular hourly rate. Thus he is not penalized in such cases, but may be called upon to explain the matter to the foreman, especially if other men have earned a substantial bonus on the same job.

#### First Reaction of Men Toward Bonus System

Various attitudes were taken by different men when the bonus system was proposed. Generally speaking, they did not want anything to do with the system; the majority of the workmen thought it ridiculous to put die or jig work on the bonus system. However, the system was started by gaining the cooperation of some of the men who were willing to try out the plan.

The time was set from previous records of the faster men and estimates made by three tool division heads, taking an average of the three estimates and comparing it with the day work records. It

WILLIAM C. Betz was born in New York City in 1883, and received most of his early education in the public schools of that city, which was supplemented by several correspondence courses. In 1901 he became a machinist apprentice with Russell & Erwin Mfg. Co., New Britain, Conn., and later was employed by the Pratt & Whitney Co., Hartford, Conn., on jig and fixture work. After obtaining experience with a number of other companies, he was employed as gage and die maker with the Hart & Cooley Co., New Britain, Conn., and subsequently took charge of the gage department of the Fafnir Bearing Co., of the same city, afterward also being placed in charge of the die, tool, and machine departments. In 1923 he was made master mechanic and also given supervision over the press department. Mr. Betz has been an instructor in the State Trade School in New Britain.

may seem unfair to the company to allow the men all the saving, but is it? What difference does it make if we give a man all he saves, so long as his average earnings do not exceed a bonus that is considered fair for the extra effort put forth?

We could split the time saved, allowing a certain percentage to go to the man and the rest to the company. But this would only give us a lot of extra bookkeeping and some of the men a headache in attempting to figure out what they gained by the system. The amount of the bonus over and above a man's hourly rate must be satisfactory if he is expected to get the work out faster.

#### How the System Gained Favor

The men who were in favor of the bonus plan soon proved to the company and themselves that it was a paying proposition all around. No attempt was made to give any bonus jobs to the men who were opposed to the plan. The company simply waited to see what effect the extra pay made by the other men would have on those who were averse to the system. It was not long before one man after another wanted the bonus jobs.

It is interesting to look back over the six years in which the system has been in force. At the beginning, one of the best men threatened to leave if the bonus system were installed. After much persuasion, however, he was induced to stay, with the agreement that he would not be put on the bonus system.

By accident a bonus job was given this man after the system had been in use some months. When this was found out, it was decided not to mention the fact and note what reaction it had on the man. He did not say a word but got that job out in such good time he must have surprised himself as well as the company. On turning in the job, he asked the foreman if he was entitled to the bonus. He got the bonus, and it was not long before he was asking for the bonus jobs. Since that time this man has carried home many extra hundreds of dollars.

Bonus work, of course, subjects the machines and tools to harder usage. A workman does not look for the smallest machine in the shop when he is on a bonus job, nor does he set his machine to take the smallest chip possible. Instead the machine is generally operated at its maximum capacity.

#### Effect of Bonus System on Accuracy

Naturally bonus work must be more carefully inspected, as there is likely to be a tendency on the

part of some of the men to pass work that is not always up to the highest standard. Sometimes work is rejected, in which case the man loses all the bonus time. In other cases, the work may be sent back for correction. The corrections must be made on the man's bonus time. This system, of course, tends to make the workmen more careful.

It is amusing to hear some of the arguments presented when the workmanship on a piece is in question. Of course, if the work is usable, it is passed, although it may not be strictly in accordance with the drawing specifications. The main thing is to be sure that it will serve its purpose.

Sometimes it happens that the time on a job is set too high or too low. The time set on the jobs,

however, averages up, and very good results are obtained with the present rates, the low offsetting the high. It is estimated that the number of jobs that are set either too high or too low amount to only about 20 per cent of all the bonus jobs. When a new piece of work is handled, it is carefully tabulated, the time taken and the bonus time set.

In setting the time, the average speed of the man who did the work and the effort that he apparently put into the job, as well as any other pertinent factors, are taken into consideration. This record is kept in a card file for reference on future jobs of the same or a similar kind. From these records new bonus times are set whenever it is found necessary or desirable.

# The Application of Non-Metallic Gears

Report Presented by Professor Earle Buckingham at the Recent Spring Meeting of the American Gear Manufacturers' Association

ON-METALLIC gears should be considered as a class distinctly apart from metallic gears because of their widely different physical characteristics. As a matter of fact, no material is an exact substitute for any other material. All materials have their own peculiar and distinct characteristics, so that under certain specific conditions, each material has a field of its own where it is superior to any other. Such fields may overlap to some extent, and only in such overlapping fields are different materials directly competitive.

Thus, for example, steel is more or less ductile, has a high tensile strength, and a high modulus of elasticity. Cast iron, on the other hand, is not ductile, has a low tensile strength, but a high compressive strength, and a low modulus of elasticity. Hence when stiffness and high tensile strength are essential, steel is far superior to cast iron. On the other hand, when these two characteristics are unimportant, but high compressive strength and a moderate amount of elasticity are essential, cast iron is superior to steel.

#### Characteristics of Non-metallic Gear Materials

Considering the phenolic laminated materials used for gears, the tensile strength of these materials is slightly less than that of cast iron, the material is far softer than any metal, and its modulus of elasticity is about one-thirtieth that of steel. In other words, if the tooth load on a steel gear which causes a deformation of 0.001 inch were applied to the tooth of a similar gear made of phenolic laminated material, the tooth of the non-metallic gear would be deformed about 1/32 inch.

Under these conditions, several things will happen. With all gears, regardless of the theoretical duration of contact, one tooth only will carry the load until the load is sufficient to deform the tooth

the amount of the error that may be present. On well made commercial gears of 6 diametral pitch and finer, the average normal error will be about 0.002 inch. On very carefully cut gears, the error may be reduced to about one-quarter of this amount.

#### Tooth Load Distribution in Metal and Non-metallic Gears

On metal gears, when the tooth has been deformed the amount of the error, the stresses set up in the materials may approach or exceed the elastic limit of the material. Hence for standard tooth forms and those generated from standard basic racks, it is dangerous to calculate their strength as very much greater than that which can safely be carried on a single tooth.

On gears made of phenolic laminated materials, on the other hand, the teeth will be deformed the amount of this normal error without setting up any appreciable stresses in the material, so that the load is actually supported by several teeth. Considering this condition alone, it would be safe to introduce a contact factor into the Lewis formula for their strength, and this contact factor would be generally larger than the theoretical duration of contact in terms of tooth intervals, because the actual point of contact on successive teeth will vary from near the tip to near the root or bottom of the active profiles. Also when the theoretical duration of contact is less than two teeth, actually three or more teeth may be in simultaneous contact because of the deformation.

#### Wear of Non-metallic Gear Teeth

This deformation also introduces another condition. Assuming a non-metallic driving pinion of conventional tooth form, when the deformation becomes appreciable, the corner of the entering tooth of the metal driven gear will make premature con-

tact and start to cut or scrape a free path for itself in the flank of the non-metallic pinion. This condition is also present, but to a much lesser extent, on metal gears when the wear is excessive. The path of the corner of the driven gear, as it sweeps into and out of engagement below the pitch line of the pinion, is in the form of a loop known as a trochoid. Thus such worn tooth forms tend to have a profile of double curvature.

The same condition exists when a hob or other generating tool extends so far below the base circle of an involute that under-cutting takes place. As a matter of fact, the form of the fillet on any generated gear, whether under-cutting takes place or not, is primarily of the same trochoidal form. Hence the additional contact of non-metallic gears is of no practical value if it must be accompanied by this under-cutting, because of the deformation and scraping action of the entering tooth of the metal gear. This will not only cut away part of the active profile, but will also weaken the tooth. thus permitting additional deformation and additional cutting, and will eventually cause failure.

#### Overcoming the Tendency to Cut or Wear away the Teeth

For non-metallic driving pinions, it is possible to minimize this condition of cutting, but only by departing from conventional tooth proportions. In other words, in order to obtain the full benefits of the peculiar physical properties of this phenolic laminated material, it is necessary to design the gear teeth themselves to favor the behavior of the material and to minimize the detrimental influence of the relatively large amount of deformation. This can be done by making the tooth of the non-metallic driving pinion all addendum while that of the metal driven gear is made all dedendum. In other words, the pitch circle of the non-metallic driving pinion should be at the bottom of the working depth while that of the metal driven gear should be at its outside diameter. In this case, the path of the entering corner of the metal driven gear in relation to the non-metallic driving pinion will be in the form of a cycloid, a path that will have but little tendency to cut away the tooth of the pinion.

Such a procedure does not require the introduction of a new form of basic rack; any of the present standard ones may be used. For many reasons, the 20-degree stub tooth form would appear to be the logical selection. This form would give the smallest all addendum pinion and the smallest all dedendum gear, with favorable tooth shapes. It is also the strongest form of the standard ones and would thus favor the low tensile strength of this

material.

#### Summary of Report

To summarize: For replacement gears, where standard tooth forms and proportions must be maintained, no contact factor should be used in the Lewis formula when applied to the calculation of the safe load of phenolic laminated gears. For driving pinions of this material of all addendum form,

contact factors varying from about 1.5 up to 4 may be used safely. In other words, by modifying the design of such driving pinions, to favor the peculiar physical properties of these materials, several times the load that is safe on pinions of conventional design may be safely transmitted.

The results of an endurance test recently completed seem to indicate that when the driven gear is of non-metallic material and of conventional design, no contact factor should be used. With heavier loads than those calculated on the basis of one tooth carrying the full load, the surface of the non-metallic driven gear above the pitch line appears to be subjected to excessive scraping.

#### THE FRENCH MACHINERY INDUSTRY

According to information compiled by Trade Commissioner Thomas Butts of Paris, published in Commerce Reports, the outstanding characteristic of the French machinery industry is the degree to which it is subdivided into small units. There are more than 6000 plants manufacturing machinery; of these, only 20 employ more than 1000 men. Not more than 1000 plants employ over 100 men. The remaining 5000 plants have less than 100 workers The principal concentration center of the machinery industry is in the Paris region, where about 260,000 men are employed. The Lyon region employs about 50,000 men, and the eastern region between St. Dizier and Strassburg approximately 60,000 men; while the northern region, including Lille and neighboring cities, employs about 80,000 men. Apart from these concentrated areas, there are machinery plants in all large cities in France.

The production of machinery in France in 1929 is valued at about \$600,000,000. Approximately 460,000 men are employed in the industry. From this it may be seen that the annual production per worker averages not much more than \$1300.

There are about 100 firms in France that manufacture machine tools, but only a few of them may be said to be of any importance. Several French machine tool builders are now making high-production equipment as well as standard machine tools; but, on the whole, the domestic machine tool builders devote themselves to standard lines of machines.

#### LARGE WELDED OFFICE BUILDINGS

Two office buildings are soon to be erected with the assistance of electric arc welding, according to information furnished by the General Electric Co. A thirteen-story office building will be erected for the Southern California Edison Co. in Los Angeles, Cal. This building will be almost entirely welded by the electric arc. A fourteen-story structure is to be built for the Boston Edison Co., Boston, Mass. This will also be electrically welded. It is pointed out that these applications of electric arc welding represent the largest undertakings in building construction in which this new method of joining metals has been used.

# Notes and Comment on Engineering Topics

A New Alloy Used for Building up Worn Machinery Parts—A Door that Opens Automatically When a Truck or Person Approaches

According to information obtained from the Linde Air Products Co., 30 E. 42nd St., New York City, Hascrome is a recently introduced patented self-hardening alloy. It is very hard and tough and is being used primarily for building up worn parts of gears, sprockets, dies, and tools in general, preparatory to surfacing them with Haynes Stellite. While Hascrome does not possess red hardness to the same degree as Haynes Stellite, it can be used successfully for hard-facing some types of

parts subjected to abrasive wear.

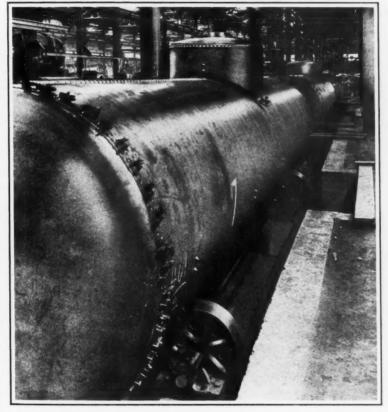
The new material is supplied in the form of welding rod and may be applied by the oxy-acetylene process to steel and cast iron. In addition to its toughness and wear resisting qualities, it has a tensile strength of 40,000 pounds per square inch and a compressive strength of over 175,000 pounds per square inch. The deposits of the material have a hardness of from 240 to 500 on the Brinell scale, depending upon the amount of excess acetylene in the flame and the rate of cooling. Slow cooling develops the hardness of the metal to a much greater extent than quenching. The

metal can be forged but not machined. Doubtless this new alloy will find many applications in the machinery industry.

placed a few feet away, the photo-electric unit functioned, and the door opened automatically. The tube and light were placed several feet from the door, so that as a person approached, the door opened.

To the list of companies that have recognized the necessity of developing a trained personnel by systematic methods, is added the Eastman Kodak Co.

of Rochester, N. Y., where special training is now being afforded young men who wish to enter the company's service in different phases of its work. The first group consists of fifty-two young men from all parts of the country who have started to work at the plant under this training program. Some of these men will be trained for laboratory work, others for productive chemical and mechanical engineering work, and still others for statistical work, merchandising and sales. The plan has been carefully organized by the company with a view to giving proper supervision and training in

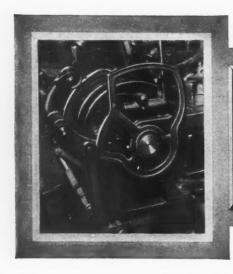


Power-driven Rolls Supporting and Turning Car Tanks in the Process of Fabrication. The Rolls are of Cast Steel with Solid Rubber Tires Pressed on them and Driven by a Link-Belt Chain

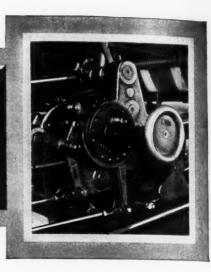
An interesting feature that attracted a great deal of attention at the recent railway exhibition in Atlantic City was the automatic door-opener demonstrated in connection with the exhibit of the General Electric Co., Schenectady, N. Y. A door was made to open swiftly and silently without apparent human agency by means of a photo-electric tube and a hydraulic door-opener. When a person passed between the light source and the photo-electric tube

every phase of the work for which these young men are to be fitted.

The General Motors Truck Co., Pontiac, Mich., has published a 44-page book giving the substance of the information obtained from the answers to a truck questionnaire sent out to truck owners throughout the country. Over 5500 business firms, operating more than 46,000 trucks, answered the questionnaire. The book contains some interesting information showing the distribution of trucks in different industries and gives a summary of their operating experiences.



# Ingenious Mechanical Movements



#### WIRE-FEEDING DEVICE

By EARL R. PHINNEY

The device shown in the illustration can be used for feeding wire on any wire-forming or other machine requiring an accurate feed. The outer shell S is mounted on a slide or other reciprocating part of the machine which has a movement equal to the desired feed. Cage C is carried inside shell S, bearing with an easy sliding fit at both ends. This cage has two holes diametrically opposite each other into which balls B are placed. The holes are slightly larger than the balls, so that the balls move freely within them. The holes are not full size clear through to the central hole in part C, but end in a conical seat, thus allowing the balls to project through to the wire W, but preventing them from falling through when there is no wire there. Spring P pushes the cage so that the balls are carried into the taper portion of S and against the wire.

In action, the device is moved in the direction of the arrow shown on the diagram. As the balls are in contact with the wire and the shell, any resistance to the movement of the wire causes them to roll into the taper and grip the wire more tightly. This movement is very slight and does not affect the accuracy of the device for ordinary purposes. As the shell starts on its return stroke, the balls roll out of the taper, thereby releasing their grip

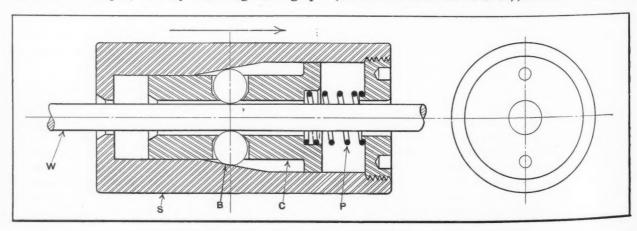
on the wire. Theoretically, three balls should be used in this device, but it has been found that two balls are entirely practical. It will be noticed that several sizes of wire can be fed and that variations in the wire do not affect the accuracy of the feed.

#### SPECIAL TOOL-FEEDING MECHANISM

By GEORGE H. PICKHARD

Certain copper tubes used in connection with steam-heating apparatus are covered with strips of copper, the strip being wound around the tube and soldered. The strip and the solder must be removed from the ends of the tubes to provide a bare length of 1 inch for connection to a tank or header. This "stripping" of the tube ends is done by using a machine having three cutters, which are held radially and feed inward as the cutter-head rotates about the tube. The machine used for this work is shown by the sectional and plan views.

A wound tube is represented by the zigzag lines A. The end of this tube is pushed over a stationary pilot B which fits snugly inside the tube. An airoperated clamp C is next tightened by pressing down the lever shown in the plan view, and the tube is ready for the stripping operation. The head of the machine, which contains the three cutters (one of which is shown at D), revolves continually



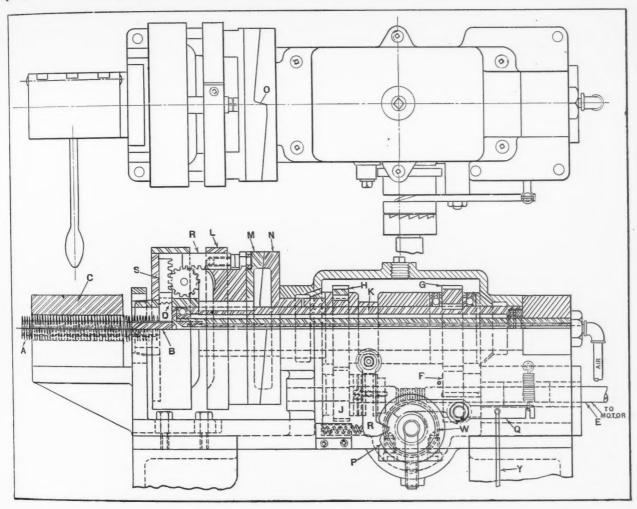
Simple Design of Wire-feeding Device of Friction-grip Type

at the rate of 600 revolutions per minute, and when a clutch is tripped by a foot-pedal, the three tools feed inward a distance of 3/4 inch at the rate of about 0.018 inch per revolution. The mechanism for obtaining and controlling this feeding movement is the interesting feature of the machine, and will now be described.

The drive from the motor to the cutter-head is through shaft E and gears F and G. Gear G is attached to the main spindle K, which connects with the cutter-head. A head L, which is rotated by the cutter-head proper, is free to slide for a

to racks S, attached to the cutter-holders. The method of obtaining this differential movement between cam sections M and N will now be described.

In order to start the tool-feeding movement, the left-hand end of clutch trip lever Q is raised by depressing a foot-pedal attached to rod Y. This releases a clutch dog or plunger connecting plate P through a clutch with the shaft of worm-wheel W, which is rotated continually from the driving shaft E. As soon as plate P begins to revolve, the dog or clutch lever R is forced out of the notch in plate P, thus connecting, through a clutch, driving shaft



Sectional and Plan View Showing Tool-feeding Mechanism Equipped with Mating Cam Sections which Rotate at Different Rates to Provide the Motion Required

limited distance along spindle K. Attached to sliding head L there is a cam M which fits a mating cam N. Cam N is free to revolve on spindle K, and it has attached to it a gear H which meshes with the gear J.

Before the tool feeding movement begins, cam M drives the mating section N through the step or shoulder O (see plan view), and gears H and J revolve idly. When the tools are to be fed inward, cam N is rotated 40 1/2 revolutions to 40 revolutions of cam M. The result is that cam N exerts a wedging effect against M, causing the latter, with head L, to slide along the spindle. When this sliding movement occurs, racks R, attached to sliding head L, transmit this movement through pinions

E with gear J; consequently, cam section N is now driven from shaft E through gears J and H, and since it rotates 40 1/2 revolutions to 40 revolutions of cam M, the wedging action and traversing movement previously referred to occurs. This difference in the speeds of cams M and N is due, of course, to the ratios of gears F and G as compared with gears J and H. Gear F has 25 teeth and G 40 teeth; hence, for each turn of gear G, F makes

40/25 turn. Therefore, 40 turns of G require  $\frac{20}{2}$ 

 $\times$  40 = 64 turns of shaft E and gear F. For each turn of gear J, H makes 31/49 turn, as J has 31 teeth and H 49 teeth; hence, if J makes 64 turns

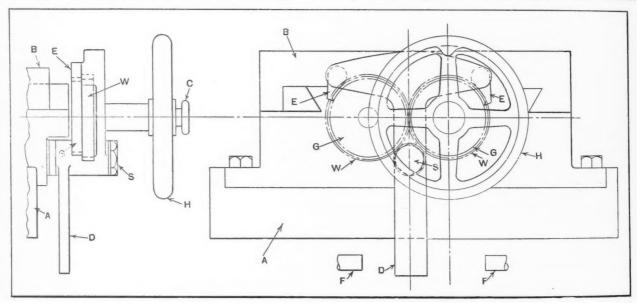
then H will make  $\frac{31}{49} \times 64 = 40 \text{ 1/2 turns.}$ 

While shaft E is turning sixty-four times in order to complete one cycle in the movement of the feeding mechanism, plate P is turned 64/65 revolution, as the worm-wheel W has sixty-five teeth. At the end of the cycle, clutch lever R is again opposite the notch in plate P and gear J is disconnected from the driving shaft, thus stopping the feeding movement automatically. Shoulder O on cam N is also around to the point where section M can slide back into engagement, which it is forced to do by means of springs concealed in the cutterhead. The difference in the speeds of the two cam sections is so slight that this re-engagement occurs easily and without objectionable shock.

The air-line shown at the right-hand end of the machine leads all the way through the spindle to the stationary pilot, and is used for blowing out anism applied as shown in the illustration, however, the pawls E must be thrown up out of contact with the ratchet feeding wheels in order to permit the slide to be fed inward by the handwheel.

The member D of the mechanism is mounted on a fulcrum stud S and carries the two pawls E. When the table A is about to reverse at either end of its travel, the lower end of the lever strikes one of the adjustable stops F. This action causes member D to pivot about stud S, thus transmitting a rotary motion to one of the ratchet wheels G through the pawl E. The ratchet wheels are secured to meshing gears W, one of which is mounted on the cross-slide feed-screw. Thus the pivoting or angular movement of member D causes the feed-screw to be rotated a certain amount when the table reverses at each end of the stroke.

The amount of angular movement of member D is determined by the position of the stops F with respect to the position of the table at the moment



Reciprocating Grinder Table Equipped with Automatic In-feed Mechanism

the chips, which otherwise would pack in the head and necessitate stopping the machine frequently to clean them out.

# AUTOMATIC IN-FEED FOR RECIPROCATING GRINDER TABLE

By TOM WRIGLEY

The mechanism shown in the accompanying illustration was designed to provide an automatic infeed for the reciprocating table of a grinding machine. The mechanism is so designed that the table is fed inward at the moment of reversal at each end of the stroke. The cross-slide or unit B, which is actuated by the feeding mechanism, is mounted on the reciprocating table A of the grinding machine. The handwheel H can be connected with the cross-slide feed-screw by setting the knob C to engage an internal clutch. When the handwheel is thus connected, it provides a means for feeding the cross-slide in or out. With the automatic feeding mech-

of reversal. After member D has been actuated by coming in contact with one of the stops F, it is inclined in the proper direction for operation by the stop F at the opposite end of the table.

#### NEW METHOD OF MAKING LEATHER BELTS

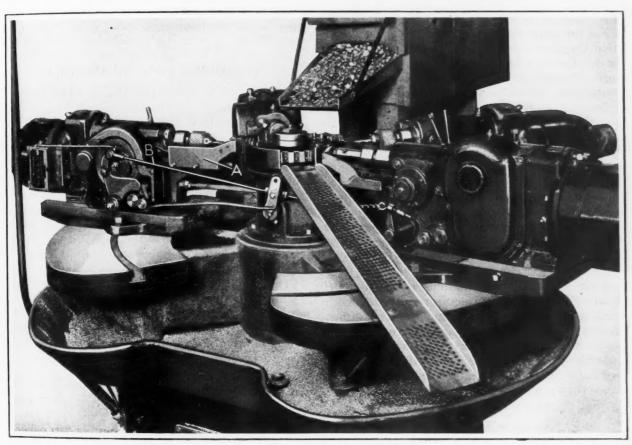
An entirely new development in the leather belting industry has been introduced by the Graton & Knight Co., Worcester, Mass. The new method is known as the "tension cementing" process for the making of flat leather belts. Special machinery has been developed for the application of the process, which uses a cement that is waterproof and very flexible and has a high heat crystallization point. The new type of belting has been thoroughly tested for over two years under varying conditions in many industries, and is said to effect definitely lower maintenance and operating costs. The company invites belting users to visit its plant at Worcester to see the new machinery in operation.

#### DRILLING AND TAPPING 3150 FITTINGS HOURLY

Small brass lubricator fittings are drilled and tapped at the rate of approximately 3150 per hour in the plant of the Alemite Corporation, Chicago, Ill., by the use of the machine here illustrated. One-quarter-inch drills and taps are used in the operation. Four automatic heads arranged alternately for drilling and tapping are spaced around a work dial which is indexed to carry the work-pieces to the heads. One pair of heads drills and taps every second fitting, and the other pair drills and taps those that were skipped by the first pair of heads.

#### GIANT ELECTRIC GENERATORS FOR RUSSIA

Four 77,500-kilowatt hydro-electric generators, said to be the largest in the world, have been built by the General Electric Co. for the Dnieper River development in Russia. The total weight of each generator is approximately 880 tons, while the weight of the rotor and the shaft alone approaches 490 tons. The maximum diameter is approximately 42 feet, and the generators have an over-all height of 40 feet 5 inches, of which 17 feet 6 inches will extend above the floor of the plant when installed. In the manufacture of these huge pieces of machin-



Machine Arranged with Four Automatic Heads for Drilling and Tapping Small Lubricator Fittings, Two Pieces Being Finished at Each Indexing of the Work-fixture

The four heads slide in unison toward and away from the work-fixture with each indexing. Each head is equipped with a bracket A that advances in front of the drill or tap to push the part firmly into the slot in the indexing dial and thus hold it securely for the operation. The tool then advances into the work through an opening in this gripping bracket.

The four heads are connected to each other, and thus move simultaneously. The work-fixture is indexed by movements imparted to it through rod B each time that the heads are withdrawn radially from the fixture. A girl operator loads the fittings into the fixture from an overhead hopper provided with a shelf which extends almost to the fixture. The fittings fall automatically into the chute at the front of the machine when finished.

ery, large castings have been eliminated by the use of fabricated welded construction.

Because of shipping limitations the stator of the generator is made in six sections. The heaviest single piece to be handled in shipment will be the 40-inch steel shaft, 36 feet long, with a coupling flange at one end which is 70 inches in diameter. This part weighs about 68 tons. The water turbines that will drive the vertical generators are being built by the Newport News Shipbuilding & Dry Dock Co.

The Division of Simplified Practice of the Bureau of Standards, Washington, D. C., has just published Simplified Practice Recommendation No. 90, giving tables of sizes of hacksaw blades.

## **Current Editorial Comment**

In the Machine-building and Kindred Industries

#### DRAWINGS SHOULD GIVE TOLERANCES

Drawings are the universal language of the machine shop. Just as written instructions must be accurate and definite, so the instructions given through the medium of a drawing must be definite and must allow of only one interpretation.

The machine shop industry as a whole has not reached the point where drawings are always made so that the shop man will know exactly what is required. Lack of tolerances is the most common defect. Numerous instances have been called to our attention where work has been rejected by the purchaser as not being sufficiently accurate when the purchaser's drawing gave no tolerances at all. If a dimension is given in fractions of an inch, it is unreasonable to expect that the shop man will produce the work to a tolerance of, say, 0.0005 inch.

A campaign of education for more accurately dimensioned drawings is needed in the machinery industries. Buyers of tools and other machine shop products should never place an order without showing on the drawing the degree of accuracy required in the finished article. One well-known manufacturer accepts all orders on the basis that if no tolerances are specified, limits of plus or minus 0.010 inch are allowable. Manufacturers are justified in returning all drawings that are not properly dimensioned with tolerances. In fact, it is often necessary for them to do this for their own protection, as too many instances are recorded where heavy losses have had to be sustained by manufacturers because they could not guess at the degree of accuracy that the customer expected.

#### THE "CATALOGUE ENGINEER"

The expression "catalogue engineer" sometimes is applied to a machine designer who depends to a great extent upon catalogues as a source of information. The implication is that either general or detail designs of other manufacturers are copied—more or less—in producing similar equipment. No one would approve of such practice; but there is another kind of catalogue engineer—the designer who uses catalogues to keep informed about parts or products that may assist in economical designing practice.

Most machines are equipped with commercial parts or unit mechanisms which the average manufacturer purchases from some outside firm. Such parts include lubricating devices; ball, roller, and oilless bearings; clutches; pulleys; speed-changing mechanisms; chain transmissions; cut gearing; motors; and many other specialized products. It is evident that the designer who specifies such com-

mercial parts or unit mechanisms should be familiar with the different types that are manufactured, in order to take advantage of important recent developments. In this connection, catalogues are valuable to the designer, and the advertising sections of technical journals are of even greater value as a source of information about some of the very latest developments.

#### OBTAINING LONG REAMER LIFE

The system of cylindrical hole tolerances adopted by the plants of the General Motors Corporation, which is described on page 961 of this number of MACHINERY, makes it possible to obtain much greater service from reamers than has been feasible with the tolerance systems generally used in the past. A considerable reduction in reamer costs is effected by this system. The principal feature of the plan is that while six different classes of tolerances are used, the maximum limit of the diameter of the holes is the same for all the six classes. It is only the minimum limit of a hole that varies.

This means that a reamer of maximum diameter—that is, a new reamer—can be used for finishing any hole of the same nominal size, no matter what the tolerance is. Then, as the reamer wears below the minimum diameter of the closest tolerance class, it can be used in the next class, and so on down the list.

The saving resulting from this system is obvious, and in large plants, especially, the economy should be very marked. The plan, therefore, is well worth thorough consideration on the part of all tool engineers and others responsible for economy in machining processes.

#### FOREMEN CAN AID IN REDUCING OVERHEAD

The operating expense of an industrial plant depends, to a large extent, upon the foremen of the different departments. They can do much to reduce overhead. They can limit to a minimum the employment of what is generally known as unproductive labor in their departments, and they can also do more than anyone else to prevent waste of materials, oil, and other supplies, and breakage of tools. In almost every department of the average shop there are great opportunities for reducing overhead costs, and the foreman is generally the man who knows best whether or not all the expenditures in his department are essential to turning out a product of a given quality in the required quantities.

# How the Jobbing Shop Can be Made to Pay

By Paying Attention to a Few Fundamental Principles of Management, it is Possible to Operate a Jobbing Shop Successfully and Profitably

By M. G. DEMOUGEOT, Superintendent, The H. E. Boucher Mfg. Co., New York

HE question is often asked, "Why doesn't the jobbing machine shop pay?" The answer is, "It can be made to pay and it will pay if properly managed and operated." Although, doubtless, only a few jobbing shops are really successful financially at the present time, the writer is certain that the majority could be made to pay without any large additional investment. The greatest shortcoming of the jobbing shop is the dominant thought of the owner that because the volume of his business depends upon his prices being very low, he must keep every expense at a low level; hence, small expenses that would more than repay him in greater efficiency-expenses necessary to the successful management of the business-are scrupulously avoided, with the result that profits become smaller instead of larger.

There are a few fundamental principles that apply to practically all jobbing shops. Attention to these should help to establish the business on a basis that would enable a fair return to be realized on the investment.

#### Jobs Should be Carefully Estimated and a Capable Sales Engineer Should be Employed

After the estimates have been made, they should always be checked by a second man. Many losses have been incurred because of errors that could easily have been detected by rechecking. Sufficient time should be allowed for careful work in making estimates. It is better to spend a few hours of the estimator's time than to lose hundreds of dollars because of an error in the estimate.

A good sales engineer should be employed. Such men are valuable, not only because they procure work to fill the shop, but also because they keep in close touch with the customers and transmit to the shop an outside picture that the inside men cannot obtain. They are also able to arbitrate matters between the firm and the customers more satisfactorily than a factory man can do.

#### Planning and Scheduling is as Important in the Jobbing Shop as in the Production Plant

Proper planning and scheduling is almost always ignored in jobbing shops. With proper planning and scheduling, savings can be made that will repay the expense of doing this work. Planning not only saves dollars, but also maintains the good will of the customers. A jobbing shop cannot have a better reputation than to have its customers say: "If we give this job to Brown, we can be sure not only that it will be accurate, but that it will be delivered when promised."

Many an hour is lost by the worker in the shop because the necessary information has not been obtained in time. The shop man has to wait while this information is secured. With proper planning, all the necessary information for any job would be on hand before it is turned over to the shop, and after the job is in process, there would be no need to stop work.

The records in many jobbing shops are inadequate. Every jobbing shop should have a sheet of ordinary letter size printed up for recording all the information for each job. This sheet should give the customer's name and address, a brief description of the job, the date promised, and all other information that might be important to record. In addition, it should contain a detailed statement of the number of hours spent on each operation, and the cost, as well as the amount of material used and its cost. A summary of the cost of labor, factory overhead, material, and administration and selling expense will make it possible to obtain a total cost which can be compared immediately with the estimated cost.

Another item that is frequently neglected is proper inspection. The inspection is almost always left to the shop foreman, who is already overburdened with detail work, and the amount of defective work that is likely to pass by him will cause more loss to the firm than the wages of an inspector whose only duty it is to see that no defective work leaves the shop.

# Even a Jobbing Shop Needs High-grade Executives and Good Equipment

Many jobbing shop owners seem to believe that the lower the overhead expense is kept, the greater the profit will be. It is true that the overhead should be held to a minimum, consistent with proper supervision, but the employment of cheap and incompetent supervisors is an expensive experiment. No one connected with a jobbing shop can cost the firm so much in a short space of time as an incompetent foreman or superintendent.

In the jobbing shop, one frequently finds many worn out machines. The idea that a good man can do a good job on any machine is an erroneous one. Spoiled and inaccurate work is frequently due to worn gibs or other inaccuracies in the machines. Excessive set-up time and slow cuts also increase costs, but cannot be avoided if the shop equipment is out of date. It is a good rule to place an average life limit on each tool as it comes into the plant, and to set aside a monthly sum pro-rated over the average life of the tool. In that way, money is

available to replace the machine when the time limit is reached, even though the machine may still have a second-hand value.

#### Cooperation of Foremen and Other Employes Should be Encouraged

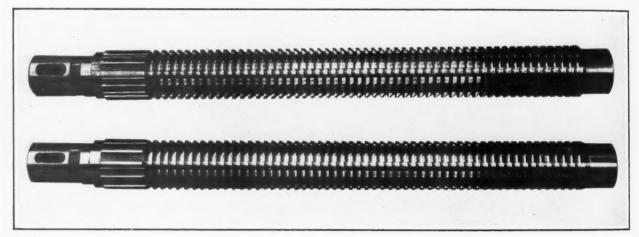
In many small shops, it is the practice to ignore suggestions made by employes, probably because it is felt that if the ideas of the employe are adopted, they may expect an increase in wages. In some cases, ideas are turned down, and a year or so later are put into effect, with no credit to the man who first suggested the plan. This practice naturally is the cause of much dissatisfaction and discouragement among the men.

The cooperation of the foremen and shop superintendents should also be encouraged by keeping them informed about how successful they have been in keeping down costs on jobs. Unfortunately, most small firms guard the job cost book as though it were their only asset. If the shop executives are

#### NEW WESTINGHOUSE LABORATORY

A new engineering laboratory is being erected by the Westinghouse Electric & Mfg. Co., at East Pittsburgh, Pa. The new structure will house approximately twenty-five laboratories for development work in nearly every branch of the electrical industry. It will be erected by the process of arc welding and will be the world's largest-although not the highest-building so constructed. More than \$2,000,000 has been appropriated by the Westinghouse company for the construction of this laboratory and for the installation of testing equipment, The building will be eleven stories high and a block in length. Five stories and the basement will be devoted to laboratories, and the upper six stories will house the offices of the engineering staff, consisting of several hundred people.

Among the unique features of the building will be a section in which may be duplicated almost any kind of weather condition. The humidity of a



Broaches of Unusual Size—6 Inches in Diameter, Having Ten Splines—Recently Made of High-speed Steel by the American Broach & Machine Co.

at all conscientious, it will be a matter of pride with them to produce as good a financial showing for the firm as possible. To stimulate their interest, a monthly report is of value. This report should contain a list of the jobs completed, the amount received, the total cost per job, and the profit or loss on the work.

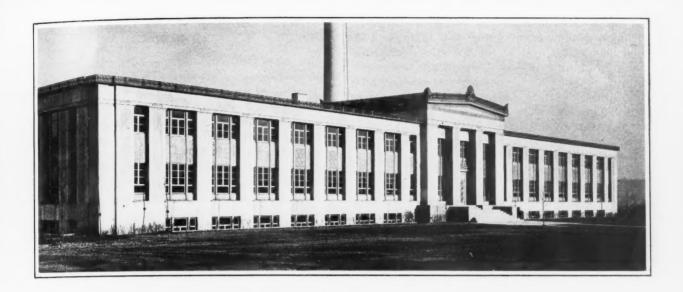
#### Regular Meetings of Executives Aid in Solving Shop Problems

In the average jobbing shop, no regular meetings of the executives are held. The reason usually given is that time is too valuable for such meetings. It would not take a great deal of time to have at least one meeting each month at which all the shop executives would come together and take up any new problems facing the shop. This would encourage the supervisors to think up new ideas and present solutions to unusual problems. Briefly, jobbing shop owners who will adopt a few of the simple methods outlined in the foregoing, which have aided in making a success of regular manufacturing shops, are likely to find that it is possible to make a jobbing shop pay.

tropical lowland may be duplicated for use in making high-voltage tests. On the other hand, the bitter cold and rarefied atmosphere of several thousand feet altitude may be produced by special refrigeration for the study of electrical apparatus exposed to prolonged cold weather.

# COOPERATIVE ADVERTISING CAMPAIGN PLANNED

The mill supply manufacturers and distributors, at a recent convention at Memphis, Tenn., decided to enter upon a joint advertising campaign, and to undertake a thorough study of industrial distribution from every angle. A research department is planned to record data that will be useful to manufacturers, distributors, and users of mill supplies alike. The advertising campaign will be managed on a broad basis and will make use of both national magazines and engineering and trade journals. The expense of the campaign will be carried jointly by manufacturers and distributors. The new departure should prove very helpful to the mill supply industry as a whole.



### A Modern Industrial Research Laboratory

The New Research Laboratory of the Aluminum Co. of America is an Excellent Example of How Industry Seeks Facts

MUCH has been said and written to the effect that industrial and scientific research has not received the attention in this country that it has in Europe. This may have been true a few years ago, but it certainly is not so today. Many of our large industrial corporations maintain laboratories on a scale that no one dared to predict only a decade ago. The latest addition to these laboratories is the new research building recently completed by the Aluminum Co. of America at New Kensington, Pa.—one of the most completely equipped research laboratories of its kind in the world.

Here, under the supervision of Dr. F. C. Frary, director, and J. D. Edwards and H. E. Bakken, assistant directors, more than 120 highly trained

engineers, chemists, and scientists, augmented by a large clerical staff, devote their entire time to research and experimental work. What a contrast this laboratory is to the woodshed work shop in Oberlin, Ohio, where Charles M. Hall, single-handed, forty-four years ago, discovered the commercial process of producing aluminum.

As is most fitting in a building of this kind, devoted to research on the applications of aluminum, this metal has been used as a structural and decorative material for architectural use throughout. The main entrance is through aluminum doors with cast aluminum grille work. Surmounting the building is a decorative aluminum cornice. Wall fixtures, chandeliers, elevator doors, elevators, and office furniture are all made from aluminum or aluminum

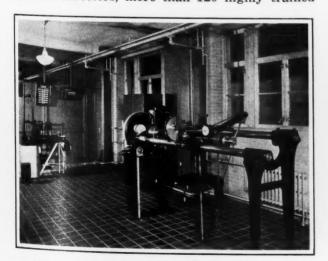


Fig. 1. View in the Physical Testing Laboratory, Showing Torsion Testing Machine

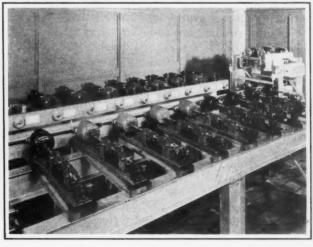


Fig. 2. Machines for Determining Endurance Limit of Aluminum and its Alloys

alloys, and so are the stairway balustrades, radiator casings, window frames, and door fittings. The hot and cold water system for the entire building is of aluminum pipe, but most significant is the use of aluminum tanks and pipes for the storage and distribution of distilled water, the purity of which is essential in the research activities. This installation is based upon twelve years of satisfactory experience in handling distilled water in aluminum containers for laboratory use.

The laboratory building is made of white brick, 275 feet long, with wings 108 feet long extending toward the rear at each end. The experimental equipment throughout is of the latest and highest grade available for scientific work. The building includes a modern machine shop of appropriate size equipped with high-grade machine tools. Even a rolling mill for rolling aluminum sheets is in-

stalled on a small scale, together with furnaces, shears, and auxiliary equipment.

The chemical laboratory, of course. is equally complete in its equipment. The rear of the laboratory is two stories high, permitting the use of fullsized test units of plant equipment. One of the interesting provisions in the laboratory is the equipment for making tensile tests at temperatures rang-

ing from 112 degrees F. below zero to 1200 degrees F. above.

To test the effect of climatic conditions on aluminum, artificial weather can be produced, including sunshine (by means of ultra-violet light), summer heat, rain, frost, and winter cold. An extensive technical library is provided, and in addition to the reference volumes available, 75,000 titles of books, articles, and reports are indexed.

The laboratory is a fine testimony to the interest that modern industry is taking in research work. It is also an argument in favor of large-scale industry, because small scattered companies could not provide the high-grade testing equipment made possible by the concentration of industry that has proved essential to our present-day engineering progress.

According to Facts and Figures of the Automobile Industry, issued by the National Automobile Chamber of Commerce, there are close to 35,000,000 motor vehicles in use in the world, of which number 26,500,000, or 76 per cent, are in use in the United States.

#### NEW DEVELOPMENTS IN LOCOMOTIVE DESIGN

Two new railroad engines have recently been built in England embodying new features of design. One of these is an entirely new departure from previous practice in British locomotive design. The boiler has been made as large as the extreme limit of the railway clearance gage will permit and there is no room for a smokestack to project above the boiler. The working pressure of the steam is 450 pounds per square inch, which has necessitated the use of a water-tube type boiler. Fuel economy is the object in view. The engine is of the four-cylinder compound type. The air supply to the fire-grate is preheated, the air being taken from the front of the smoke-box.

The other new locomotive has one cylinder work-

ing at a pressure of 900 pounds per square inch and two cylinders working at a pressure of 250 pounds per square inch. This engine has three boilers, in one of which the pressure reaches from 1400 to 1800 pounds per square inch. From this boiler the second boiler (or highpressure drum) is fed, the latter supplying steam to the high-pressure cylinder. The third boiler supplies steam

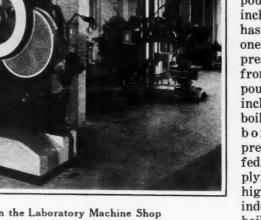


Fig. 3. View in the Laboratory Machine Shop

to the two low-pressure cylinders. The steam exhausted from the high-pressure cylinder is mixed with that from the low-pressure boiler, and the mixture is used by the low-pressure cylinders.

#### CONVENIENCE OF ADVERTISING FOLDERS

Recently the writer has received several advertising circulars that were very inconvenient to read because of the manner in which they were arranged and folded. The natural method of conveying information in a circular is to arrange the matter in pages, the same as in a book. We are accustomed to turning over page after page, and a circular so arranged is usually convenient both to read and to handle.

The modern folders that open up until you have in front of you a sheet as large as your desk are wasteful and ineffective. Such folders usually find their way into the waste paper basket because they are inconvenient to read, cumbersome to handle, and difficult to file in ordinary filing cabinets.

The object in sending out advertising literature is to have it read. The easier it is to handle, the more likely it is to be read.

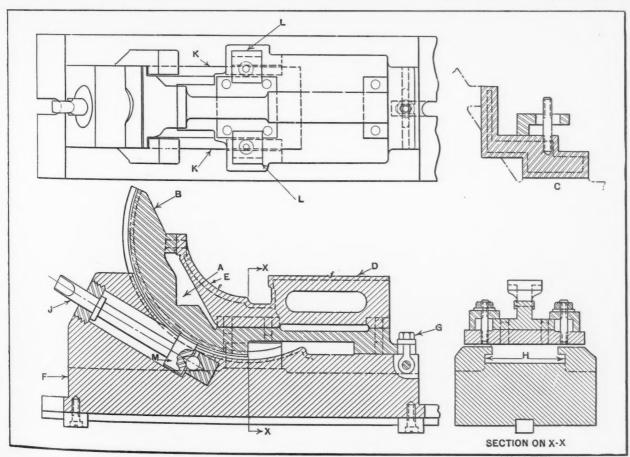


#### FIXTURE FOR MILLING ARCS

By ARTHUR MUMPER, Cleveland, Ohio

In the illustration is shown a fixture for milling arcs as well as straight surfaces. It is used in a hand milling machine, and although primarily designed for the part shown in the fixture, it was later used for other parts of a similar shape; the only modification necessary to suit the fixture for handling different parts was to cut out the notch at A to fit adapters such as that shown at C.

The piece being machined is part of a bottle washing machine, and is made of heat-treated duralumin. It is fastened to the work-holder B by means of the straps L, and is milled on the flat surface D and the circular surface E. While the surface D is being milled, the holder is clamped securely to the fixture base F by means of the swing bolt G; but in order to mill surface E, a circular motion of the work is necessary. This motion is obtained by means of the worm M, which is revolved by a crank at the end of shaft J and meshes with corresponding teeth



Fixture which Moves Work through a Circular Path for Milling an Arc

cut in the holder B. When the circular surface is to be milled, the bolt G must be released and swung to a position to clear the holder. As the worm is rotated, the holder B is forced to revolve. The projections K on both sides of the holder, sliding in the ways H on the base, serve to confine the holder in its circular path.

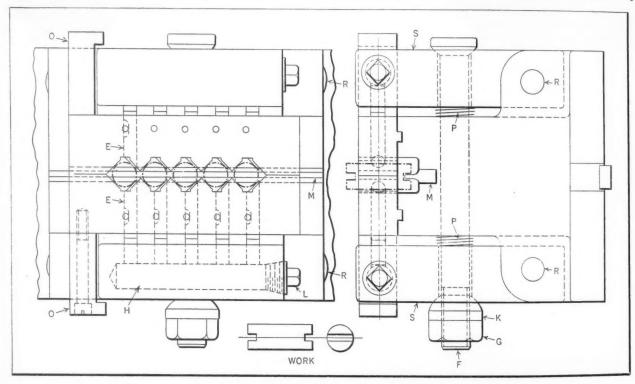
# MILLING FIXTURE WITH CENTRALIZING FEATURE

By DONALD A. BAKER, Long Island City, N. Y.

In milling the ends of round pieces supported by V-blocks, difficulty is often experienced in maintaining the location of the cut accurately for the vided in the bolt holes to permit the clamps to be swung freely on the hinge pins R. Near the top of each clamp a cross-hole H is drilled, while at right angles to this hole and entering into it are a number of other smaller holes, lapped to receive the hardened pins E.

The two large cross-holes are filled with beeswax and plugged with a pipe plug L. The outward swinging movement of the clamps is limited by the stops O, so that they can open only enough to release the sliding pins from the work. The locating strip M is secured in the base casting and serves as a stop as well as a locator for the pieces being milled.

To operate the fixture, the work is placed in the position shown in the vees, and is located on top



Milling Fixture in which Work is Centralized Accurately Regardless of Variations in Work Diameter

entire lot. This is usually due to the variations in the diameter of the work. With the fixture shown in the illustration, however, this variation does not affect the location of the cut.

The work is placed in a series of square openings cut in a split block which is fastened to the fixture base. The sliding pins E that secure the work are beveled at the inner ends to an angle of 45 degrees, and are actuated by the side clamps S. These clamps are tightened simultaneously by the bolt F and nut G. It is obvious that, with this construction, the pieces can be located close to each other, and little time is wasted while the cutter passes over the slight gap between the work. The rapid loading feature of this fixture also permits a greater output to be obtained.

It may be noted here that the shoulder underneath the head of the bolt F and one side of the washer K are curved and supported in similar shaped seats in the clamps; clearance is also pro-

of the strip M for the first cut. For the second cut, the work is located by the newly milled slots engaging the narrow portion of the strip. After the pieces have been inserted in the fixture openings, the clamps are tightened, transmitting pressure through the beeswax to the pins E; this results in an equalized action which produces the same pressure on all the pins.

The action of the opposing sliding pins helps to force the parts into the vees in an exact central position; and even if the diameters do vary, the work will still be retained in a central position relative to the cutter. To prevent pins E from rotating, they are flattened off and short pins are driven into the V-block close to the flattened section. Two coil springs are provided at P which open the clamp as soon as the nut G has been unscrewed.

Although not shown, a special gage-block is provided for setting the cutter centrally and to the

proper depth. The writer suggests that in making the V-blocks, the best method is to clamp them face to face while grinding the vee surfaces. In this way, there should be no trouble in obtaining great accuracy, because even though one vee is larger than the other, the adjacent vees will be symmetrical and will still locate the pieces centrally.

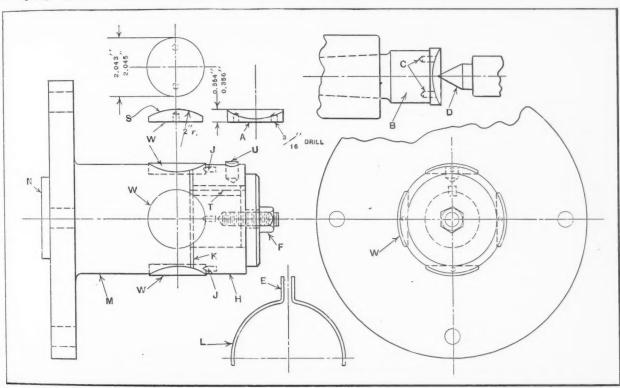
## TURNING FOUR CAST-IRON RETAINERS SIMULTANEOUSLY

By CHARLES C. TOMNEY, Tool Designer, Brunswick-Kroeschell Co., New Brunswick, N. J.

The fixture of rather unusual design shown in the accompanying illustration is employed at the plant

The clamp L is next slipped over the pieces and the ends E pinched together with the fingers so that the work will be properly seated after tapping the pieces with a soft hammer and tightening the clamping nut F.

While the recesses in which the work is held were being machined, the clamping collar H of the fixture was located in the position shown, a washer or shim 1/16 inch in thickness being inserted at K to provide the necessary clearance for clamping. The clearance space at K is located off center purposely, in order to facilitate locating and holding the work in place while the fixture is being loaded. The pointed and hardened tool-steel pins J driven into the clamping collar H project about 3/64 inch into the counterbore. These pointed pins bite into the work



Fixture Used in Turning Surfaces of Four Parts to the Required Radius Simultaneously

of the Brunswick-Kroeschell Co. in machining castiron retainers like the one shown at W. The operation for which this particular fixture is employed consists of turning the surface S to a radius of 2 inches. Previous to turning this surface, the pieces are faced on the surface A and drilled as indicated. After being drilled, the pieces are mounted on the taper-shank holder B shown in the view at the upper right-hand corner of the illustration while turning the outside surface to the specified diameter. Two pins C in the holder B and the tailstock center D serve to hold the piece in place during the turning operation.

Four of the pieces thus machined are then mounted on the special turning fixture, as shown in the illustration. Before placing the work on this fixture, a ring L made of flat steel stock with the ends bent up, as indicated at E in the half-section view, is placed over the hub M. Four of the pieces W are then placed in the recesses machined in the hub M.

and hold it securely in position when the clamping nut is tightened.

The key at T serves to keep the collar H accurately aligned. The recesses in which the work is located are machined to a depth that will give the pieces the required thickness when they are turned to a radius of 2 inches. As the recesses are equally spaced, the machining operation can be accurately checked by measuring over two opposite pieces. When the pieces are machined to the correct size, this measurement will, of course, be 4 inches.

The hardened steel button U was driven into a hole in the clamping collar H and then ground to a radius of 1.990 inch for use in setting the turning tool. When the tool is being set for the finish cut, a feeler 0.010 inch in thickness is used between the ground surface of the button and the point of the tool. A pilot N at the rear of the fixture fits into a counterbored recess in the faceplate and serves to align the fixture accurately.

#### GAGES FOR CHECKING WOODRUFF KEYWAYS

By W. N. DELENK, Machine and Tool Engineer, The National Acme Co., Windsor, Vt.

When keyways are milled in interchangeable shafts, some method of gaging is necessary to main-

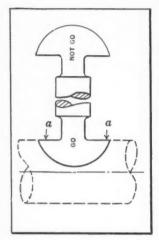


Fig. 1. Depth Gage for Woodruff Keyway

tain the correct location. Several types of gages used by the writer for checking Woodruff keyways are shown in the accompanying illustrations. In Fig. 1, is shown a limit gage used for checking the depth of the keyway, the surfaces a serving as gaging points.

When it is desired to have two keyways in accurate alignment and coinciding with the radial center line of the shaft, the double-end gage shown at *B* in Fig. 2 is used. Here it can be seen that

the four lugs b hold the gaging points c in the correct relation to the center line of the shaft. If these points do not enter the keyways easily, the work should be rejected. The gage shown at A is similar to the one just described, except that it is designed for checking one keyway only.

For checking the distance from a shoulder to the center of the keyway, the limit gage shown at C in

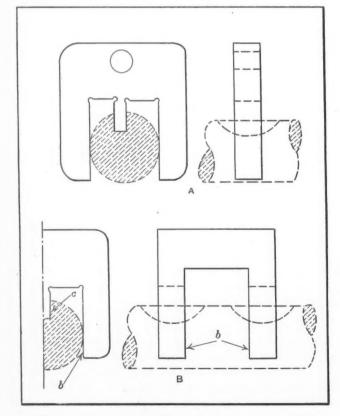


Fig. 2. Gages for Checking Alignment and Central Position of Keyways

Fig. 3 is used, the two surfaces d coming in contact with the outside diameter of the shaft when the keyway is located correctly. The same principle is applied to gages for checking the distance between two keyways in line with each other. An example of this type of gage is shown at D.

It is sometimes desirable to check the distance from the end of a shaft to the center of the keyway, in which case the hook gage shown at E can be used effectively. It is evident that the precision of the gages shown at C, D, and E is wholly dependent on the accuracy of the distance X. This dimension is

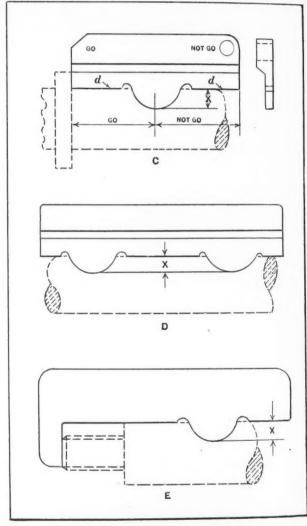


Fig. 3. Gages for Checking the Distance from the Center of Keyways to Points along a Shaft

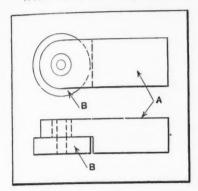
not usually given on the part drawing of the shaft, but the formulas for obtaining it may be found in MACHINERY'S HANDBOOK.

# DISK AND CLAMPING BLOCK FOR LOCATING HOLES

A simple device for use in accurately locating, drilling, and reaming holes in work of various kinds is shown in the accompanying illustration. It consists of a hardened and ground bar A into which is pressed a shouldered disk B, the outside diameter

of which is ground true with a lapped hole through the center. The central hole is used either as a guide for drills and reamers or for holding bushings that serve as guides.

With this tool, the proper location of the holes is



Hardened Steel Disk and Clamping Block for Locating and Drilling Holes

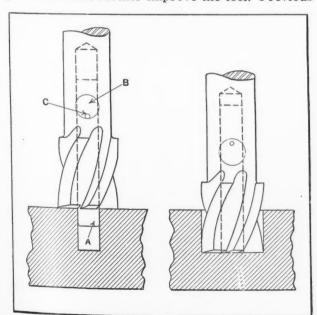
obtained by the use of a depth gage or other measuring device, depending upon the character of the work. all measurements being made to the edge of the disk, while the body A is used as a means for clamping the disk B in placeafter it has been accurately positioned. D. A. B.

#### COUNTERBORE WITH RECEDING PILOT

By H. MOORE, Hamilton, Ontario, Canada

The counterbore shown in the accompanying illustration is used in producing blind holes with flat bottoms. The feature of this tool is the sliding pilot A which serves to guide the counterbore at the beginning of the cut, as shown in the view to the left, and then recedes into the tool when it comes in contact with the bottom of the guiding hole, as shown to the right. This construction permits the counterbore to cut to the bottom of the guiding hole.

Any ordinary counterbore can be equipped like the one shown by drilling a hole B through the shank where the metal is comparatively soft. The usual pilot is replaced by a longer one drilled for the small retaining pin C. A coil spring behind the pilot would still further improve the tool. Previous

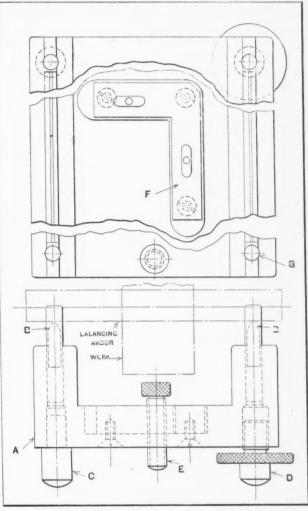


Counterbore with Sliding Pilot Designed to Produce Flat-bottomed Holes

to using the tool shown, the hole in the work was counterbored as deep as possible, using a regular pilot. The pilot was then removed and the hole finished to the required depth. This method, of course, necessitated stopping the machine and employing a screwdriver to remove the pilot.

#### FIXTURE FOR BALANCING LIGHT WORK

The fixture here illustrated is used on a drilling machine table for accurately balancing gears, rotors, impellers, etc., which are too small to be



Balancing Fixture Used for Very Small Work

balanced effectively on a regular balancing machine. Driven into the top of the base A are two knife-edges B on which the arbor for holding the work is rolled for balancing in the usual way. Accurate setting of the fixture is obtained by adjusting the supports D and E until the two-way level F—securely fastened into the base—reads correctly.

The supports C and D rest on the bottom of the table slot, and are a slip fit in the latter, while the support E rests on the top of the table. This arrangement prevents the fixture from swinging around while in use, and becoming out of level should the machine table itself not be level. The pins G prevent the balancing arbor from rolling off the ends of the knife-edges.

# Importance of Wages in Apprentice Training

Factors to be Considered in Determining Wage Rates that will Make an Apprentice System Successful are Discussed in this Article

By C. J. FREUND, Apprentice Supervisor, Falk Corporation, Milwaukee, Wis.

UEER as it may seem, wages for apprentices are a comparatively recent innovation. It was formerly thought that the instruction the apprentice received was sufficient compensation for his work. The apprentice lived in the home of his employer where he was required to perform many duties not connected with his trade. His employer furnished him with clothing, food and lodging.

After six or seven strenuous years of work, the young man was given a certificate of proficiency in the trade, and in some countries, a new suit of clothes and a Bible. Sometimes he received a bonus-just as frequently he did not; but it appears that wages during the apprenticeship were not even

considered.

With the modern factory system, the apprentice has become an independent worker who lives in his own home and has the status of a regular employe, except that he is given special work and instruction. The employer undertakes no responsibility for the apprentice outside of working hours. Under these conditions, obviously, the apprentice must receive wages, and proper payment has become one of the important problems of apprenticeship ad-

ministration. This is apparent from the great number of small troubles encountered in the handling of apprentices that are directly caused by the

wage scale.

The Wage Rate is of Great Importance in the Success of the Training System

Most apprentice directors will agree that wages are second only to the work schedule in the number of problems they create. For instance, a certain young man, becoming very enthusiastic about the machinist trade, signed an indenture and began work as an apprentice. Within a year he found it difficult to make ends meet. Before he became an apprentice he was profitably employed, having had a very good job for one of his age. He had purchased an automobile and in other ways had established a standard of living that he could no longer maintain.

He requested more pay than his contract pro-

vided; but it was, of course, impossible to pay him more than the other apprentices who were employed under a similar contract. After much discussion, including some heated arguments, he was finally prevailed upon to sell his automobile, get along without a number of the luxuries to which he had become accustomed, and settle down to the business of learning his trade.

According to most apprentice directors, wages are second only to the apprentice training work schedule in the number of individual problems which have to be met. There are parents who cannot understand why the apprentice should receive less pay than a regular employe doing approximately the same work. It is not generally understood that the apprentice is of little or no value during the first months of his course. Because of his lack of skill, he is a source of greater danger to machinery and equipment than the trained mechanic or regular operator. He never remains on any machine or operation long enough to become a productive operator. When he has learned the job thoroughly, he is transferred to another machine. Yet the wages paid must be high enough to constitute a reasonable return for the work actually done, and at the same time, they must be low enough to make the training itself the principal attraction of apprenticeship.

In the same plant, a fine boy became an apprentice and all went well for a year or two. Then he began to associate with a number of young men who were not apprentices and who derived a greater income from their work. In spite of advice to the contrary from the employer, his parents, and others, he gave up his apprenticeship for a better paying job. In time, he was laid off and finally returned to his original employer, with the result that he completed his apprenticeship three years later than he would have if he had remained.

Frequently, difficulties are created by the parents. Sometimes they discourage a boy from becoming an apprentice, because they demand that he earn the highest possible wages. In other cases, actual family need prevents the young man

from becoming an apprentice. There are also some parents who cannot understand why the apprentice should receive less pay than a regular employe

doing approximately the same work.

Then there are foremen and department heads who imagine that the apprentice's pay is too high in comparison with that of other workers. Some refuse to cooperate in any apprentice training program, because the apprentice wage rates are set by the contract and not by themselves. There are still others who contend that the apprentice rates conflict with bonus and piece rates which they have set. Surely it is reasonable for the employer to devote much thought and attention to a matter that causes so much difficulty.

The Cost of Maintaining an Apprenticeship System Must be Considered

The wages paid must be high enough to constitute a reasonable return for the work actually done, and

yet low enough to make the training itself the principal attraction. There are certain very good reasons why the apprentice should receive less pay for a given job than a regular employe. Frequently, he has no value whatever during the first months of his course. Because of his lack of skill, he is a source of much greater danger to machinery and equipment than the trained mechanic or regular operator; his progress may be marked by broken gears, collars, and tool-heads. The apprentice never remains on any machine or operation long enough to become productive. Other employes learn a certain job and stay on it, doing effective work. When the apprentice has learned a job thoroughly, he is immediately transferred to another machine.

Moreover, the apprentice requires much of the foreman's time. The regular employe is given his work and then proceeds, with little help except in cases of unusual difficulty; but the foreman must devote hours and hours in explaining to apprentices the simplest matters connected with their work. Apprenticeship involves expensive departments for direction, supervision, and the keeping of records; and frequently special shop instructors are em-

ployed.

Also, school attendance is expensive, as apprentices usually receive wages for the time spent at school; and the teachers must be paid, either directly or in the form of taxes or contributions toward a school fund. In view of the special services rendered to apprentices, it would be unfair to the other employes to pay them on an equal basis. Finally, the lower rates of pay for apprentices are the best possible guarantee that those who apply for training are taking the work seriously and are sincere in their desire to learn a trade.

Of course, instruction is the most important element in apprentice training, and young men frequently sign the contracts and begin work without even discussing the wage question; but at the same time, wages are so important a factor that the employer who wishes to be successful in his training program must give considerable attention to the matter.

Great Care is Taken by the Shops in Milwaukee in Setting Apprentice Wage Rates

A striking example of great care in the determination of apprentice pay rates occurred in the Milwaukee branch of the National Metal Trades Association, which recently approved an increase in pay for apprentices in all member shops. The apprentice wages had been standardized for some years and the apprenticeship committee of the Association felt that conditions warranted an in-

The procedure in determining the new rates was strictly in accordance with the principle that the determination of proper wage rates is an extremely important part of apprenticeship administration. The operating committee, therefore, directed a subcommittee to make a survey of the average increase in general wages since the apprentice rates had last been set, and to prepare and submit suggested schedules for new apprentice rates on the basis of this survey.

These suggestions were thoroughly discussed at several meetings before the new schedules were finally approved. The new rates provided increases up to 17 per cent for regular four-year apprentices and cooperative engineering apprentices. These rates have been generally accepted without criticism by apprentices, employers, and the public, and are the best possible evidence of the correctness, sincerity, and stability of the apprentice training work of the Association.

### Reducing the Cost of Checking Drawings

By HARRY KAUFMAN

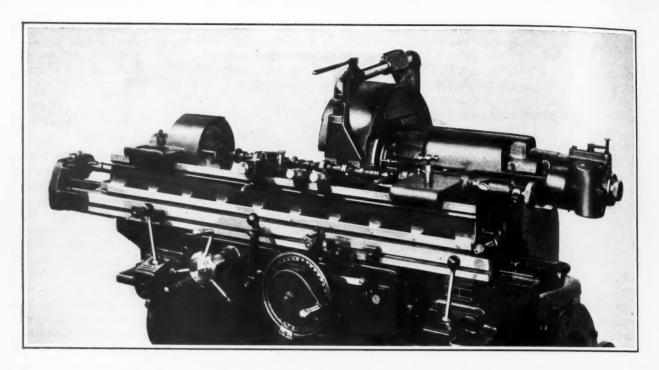
All drafting or engineering time is generally charged as overhead. The time spent in checking drawings, therefore, becomes a sort of "superoverhead" or an overhead on an overhead. In this day of close margins between the production cost and the selling price, every effort is made to reduce the overhead. The checking time is obviously a logical point of attack in attempting to lower overhead expense. Notable success in reducing the checking cost in an aeronautical plant is being achieved by following the procedure to be described.

In this plant, the design is carried out under the direction of a project engineer who issues general instructions for the design to a drafting-room squad leader. The squad leader, in turn, supervises the work of the various draftsmen assigned to the particular project. Originally, all drawings were thoroughly checked, so that the checking time averaged about 35 per cent of the drafting time.

The first step toward improvement was to keep a record of every error in the work of each man reported by the planning office or shop. In this record, the draftsman was charged with 60 per cent, and the checker with 40 per cent of the responsibility in terms of the time necessary to revise the drawing, the minimum time charged being one hour. This not only served as a good basis for rating the draftsmen's ability, but it also disclosed the fact that certain men made practically no errors of any consequence.

These men were placed in the preferred class so that, in many instances, their work was subject only to a general inspection, the detail checking operation being omitted. The use of this system during a considerable period of time has disclosed no appreciable increase in errors, and has resulted in reducing the average checking time from 35 to

15 per cent of the drafting time.



# **Duplex-Wheel Grinding of Automobile Parts**

Typical Examples of Duplex-wheel Grinding Operations Performed on Machines of the Center and Centerless Grinding Types

By JOHN M. KRINGS, Cincinnati Grinders Incorporated, Cincinnati, Ohio

HE introduction of heavier precision cylindrical grinders has made possible the use of wheels with faces up to 10 and 12 inches in width. The cutting capacity of machines formerly operated by 10- or 15-horsepower motors has been greatly increased in the newer and heavier machines by employing 20- to 30-horsepower motors. This greatly increased cutting power has been particularly favorable to the application of duplexwheel grinding.

By grinding two surfaces at the same time with the duplex-wheel arrangement, the production is practically doubled without any additional work on the part of the operator. Most of the work ground in this manner consists of shafts having multiple bearings of the same diameter, and short shafts or parts having cylindrical surfaces of different diameters. Long shafts with many bearings of the same diameter require a plunge cut for each set of bearings ground, while small parts having only two surfaces to be ground are finished in one plunge cut.

#### Selecting Duplex Wheels to Secure Uniform Wear

On parts having cylindrical surfaces of unequal size from which different amounts of stock must be removed, it is important to select wheels of the correct grades. The grades should be such that the wear will be equal on both wheels. The wheel that must remove the greater amount of stock should have a tougher bond, so that it will be able to resist

the wear caused by the heavier cuts. If the wheels are properly selected, the necessity for frequent truing will be eliminated and the required accuracy can be more readily maintained. If two surfaces are of the same size and the grinding wheels employed are of the same grit and grade, the wear on both wheels will be practically the same.

Usually, when double wheels are used, it is impossible to traverse the work in such a manner as to obtain a high finish, because of the interfering arms or shoulders. However, where a high finish is essential, the grinding machines are equipped with a spindle-reciprocating attachment. This attachment serves to move the grinding wheel spindle slowly back and forth in its journal bearings. This movement greatly improves the quality of the finish and eliminates diamond lines or patterns on the The reciprocating attachment ordinarily work. provides for spindle movements of 1/16, 3/16, or 3/8 inch. Provision is also made for stopping or starting the reciprocating movement occasionally by moving a lever.

#### Duplex Wheels Require Individual Collets

The users of duplex grinding wheels generally agree that each set of wheels should be mounted separately on its own collet and kept on this collet. Definite economies result from this procedure. If the wheels are removed from their collets when a different job is to be handled, they will be likely to

run out of balance when remounted. Considerable time will then be required to rebalance and dress the wheels properly. Incidentally, the wear on the truing diamond will be greatly increased.

In addition to the application of duplex grinding wheels to center type machines, this method has also been successfully applied to centerless grinding machines within the last two years. The hydraulic loading and unloading attachment applied to centerless grinding has been directly responsible for the increase in the use of double-wheel mounts on machines of this type. Prior to this development, work having interfering arms or shoulders could not be handled safely on the centerless type of grinding machine. The hydraulic loading attachment, however, now handles the work faster and eliminates the hazard that previously existed.

#### Grinding Shock Absorber Shafts with Duplex Wheels

In Fig. 1 is shown a Cincinnati 8- by 18-inch saddle type grinder equipped with double grinding wheels for grinding two cylindrical surfaces on the rocker shaft of a hydraulic shock absorber. These shafts are of hardened steel and both bearings are of different lengths and diameters. The two surfaces ground are separated by the rocker arm which revolves between the two wheels during the grinding operation. By grinding the two bearings simultaneously, a production of ninety-six completed shafts per hour is obtained, which is double the former output. The 3/4- and the 1 1/4-inch face

wheels each remove 0.020 inch of stock during this operation.

#### Grinding Automobile Engine Camshaft Bearings

In the heading illustration is shown a Cincinnati 8- by 36-inch saddle type grinder equipped with duplex grinding wheels for grinding the four bearings of an automobile engine camshaft. The production on this job is thirty-six shafts per hour, which is more than twice the production previously obtained with a single-wheel grinder. This machine has a spindle-reciprocating attachment which moves the grinding wheels back and forth. As a result of this reciprocating movement, a very good finish may be obtained. The operator locates the work for grinding two of the bearings simultaneously and then passes the work on to a new position for grinding the two remaining bearings. Thus the four bearings are finished in one setting of the camshaft.

Many parts of automobile transmission units are ground by the use of multiple wheels arranged to grind two or more cylindrical surfaces at one time. Steering knuckles, universal joint spiders, gear-box shafts, studs, and similar parts are handled advantageously by the duplex-wheel grinding method.

#### Application of Duplex Wheels to Centerless Grinding

The set-up for grinding two arms of a universal joint spider by using duplex wheels on a Cincinnati No. 2 centerless grinder is illustrated in Fig. 2. The

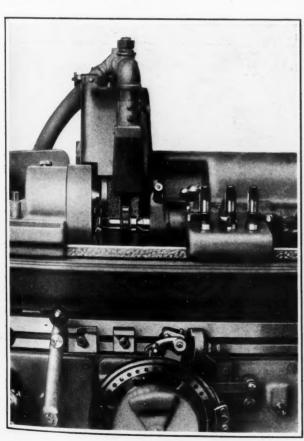


Fig. 1. Grinding Shock Absorber Shafts with Duplex Wheels on a Center Type Machine

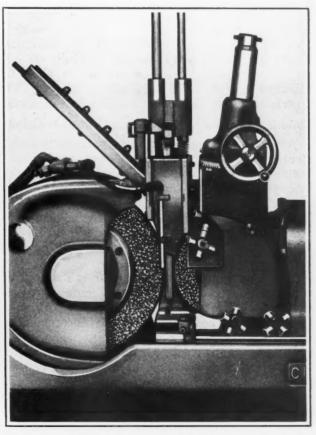


Fig. 2. Grinding Universal Joint Spider with Duplex Wheels on a Centerless Machine

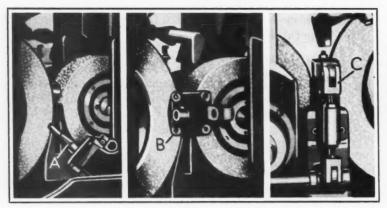


Fig. 3. Three Views of Duplex Wheels Used on Centerless Grinder for Grinding Automobile Steering Knuckles

work is placed in the inclined chute of a hydraulic or pneumatic loading and unloading fixture, after which the grinding operation is performed automatically. As the elevator portion of the fixture rises, one piece of work is released from the chute, passing by gravity to the work-carrying fingers, and is then lowered to the slotted work-supporting blade.

The automatic in-feed attachment immediately brings the duplex regulating wheel forward, thus feeding two of the spider arms to the duplex grinding wheel. The spacer between the wheels allows the two arms that are not being ground to rotate between the wheels. As the regulating wheels back away, fingers carry the piece upward, where it is ejected into the receiving chute located over the regulating wheels.

This grinding operation consists of removing 0.010 inch of stock from the arms. The work is held within limits of 0.0002 inch for roundness, 0.0005 inch for straightness and within 0.002 inch on the diameter. The net production time for grinding the four arms is 200 pieces per hour. The wheels employed each have a face width of 1 inch.

#### Finishing Steering Knuckles on a Centerless Grinder

A double grinding wheel for grinding automobile steering knuckles like the one shown at A, Fig. 3, is employed on a Cincinnati No. 2 centerless grinder. The view at B shows the work in place between the duplex wheels and the feeding or control wheel. Although the axle spindles are dynamically and statically unbalanced, they are firmly held in position on a stepped work-holding blade by an overhead equalizing pressure shoe.

The rear view of the wheels in Fig. 3 shows the equalizing device C which causes the pressure shoe to hold the work in the grinding position. Although two grinding wheels are used, only one regulating wheel is employed, the latter being trued with the proper step to provide accurate feeding of the work to the grinding wheels. The net production on these parts is 200 pieces per hour. One cut suffices to remove the 0.015 inch of stock required to finish the work. The work is held within limits of  $\pm$  0.0005 inch. A hand spindle-reciprocating attachment is used in this case to grind the face of the shoulder on the work.

#### GIANT INCLINED POWER PRESS

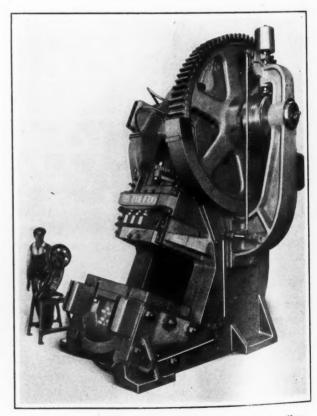
A mammoth inclined open-back power press weighing approximately 115,000 pounds was built recently by the Toledo Machine & Tool Co., Toledo, Ohio. This machine is believed to be the largest of its type that has ever been built. An excellent impression of its proportions can be obtained from the accompanying illustration in which it is compared with the smallest press built by the concern. This illustration does not show the large part of the press frame which extends below the floor.

The bed of this huge press measures 36 and 60 inches from front to back and left

to right, respectively. The slide face measures 30 by 31 inches, while the width of the opening in the back is 36 inches. The die space, or the distance from the top of the bolster plate to the under face of the slide, with the stroke down and the adjustment up, is 18 inches.

The crankshaft is of the full eccentric type. It is 10 inches in diameter at the frame bearings and 16 inches at the connection bearing, thus giving a 6-inch stroke to the slide. There is a three-bar knock-out for the slide.

Lubrication of the main bearings is accomplished through a centralized system. The press is driven by a 25-horsepower direct-geared motor, which delivers the power through a chain of gears having a ratio of 24 to 1. Fifteen strokes are made per minute. A jaw clutch operated by a foot-treadle controls the operation.



Huge Inclined Toledo Press Compared with the Smallest Press Built by the Same Concern

# Tolerances for Maximum Reamer Service

A Cylindrical Hole Tolerance System Devised to Eliminate the Necessity for Large Numbers of Special Reamers and Gages

By D. W. Ovaitt, Efficiency Engineer, Buick Motor Car Co.; and Chairman of Tool Standards Sub-committee, General Motors Corporation

THE outstanding feature of the system of cylindrical hole tolerances that has been adopted as standard by the General Motors Corporation is that the maximum limit of a hole of any nominal size is the same for six different classes of tolerances. Only the minimum limit varies.

This system has the distinct advantage of permitting a reamer of maximum diameter to be used for finishing any hole of the same nominal size, regardless of the amount of tolerance specified. As the reamer wears below the minimum diameter of the closest tolerance class, in which the tolerance

Table 1. Cylindrical Hole Tolerances and Limits

		Class	No. 6	Class	No. 5	Class	No. 4	Class	No. 3	Class	No. 2	Class No. 1		
	Nominal Size		Limit minal 0.0005" Limit minal 0.0000" nce = 005"	Max. Limit = Nominal Size + 0.0005" Min. Limit = Nominal Size - 0.0005" Tolerance = 0.001"		Max. Limit = Nominal Size + 0.0005" Min. Limit = Nominal Size - 0.001" Tolerance = 0.0015"		Size + (	ominal 0.0005" Limit ominal 0.0015" nce =	Max. Limit  = Nominal Size + 0.0005" Min. Limit  = Nominal Size - 0.0025" Tolerance = 0.003"		Max. Limit = Nominal Size + 0.0005" Min. Limit = Nominal Size - 0.0035" Tolerance = 0.004"		
Fraction	Decimal	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
1/8	0.1250	0.1255	0.1250	0.1255	0.1245	0.1255	0.1240	0.1255	0.1235	0.1255	0.1225	0.1255	0.1215	
5/32	0.1562	0.1567	0.1562	0.1567	0.1557	0.1567	0.1552	0.1567	0.1547	0.1567	0.1537	0.1567	0.1527	
3/16	0.1875	0.1880	0.1875	0.1880	0.1870	0.1880	0.1865	0.1880	0.1860	0.1880	0.1850	0.1880	0.1840	
7/32	0.2187	0.2192	0.2187	0.2192	0.2182	0.2192	0.2177	0.2192	0.2172	0.2192	0.2162	0.2192	0.2152	
1/4	0.2500	0.2505	0.2500	0.2505	0.2495	0.2505	0.2490	0.2505	0.2485	0.2505	0.2475	0.2505	0.2465	
9/32	0.2812	0.2817	0.2812	0.2817	0.2807	0.2817	0.2802	0.2817	0.2797	0.2817	0.2787	0.2817	0.2777	
$\frac{5/16}{11/32}$ $\frac{3}{8}$	0.3125 0.3437 0.3750	0.3130 0.3442 0.3755	0.3125 0.3437 0.3750	0.3130 0.3442 0.3755	0.3120 0.3432 0.3745	0.3130 0.3442 0.3755	0.3115 0.3427 0.3740	0.3130 0.3442 0.3755	0.3110 0.3422 0.3735	0.3130 0.3442 0.3755	0.3100 0.3412 0.3725	0.3130 0.3442 0.3755	0.3090 0.3402 0.3715	
13/32	0.4062	0.4067	0.4062	0.4067	0.4057	0.4067	0.4052	0.4067	0.4047	0.4067	0.4037	0.4067	0.4027	
7/16	0.4375	0.4380	0.4375	0.4380	0.4370	0.4380	0.4365	0.4380	0.4360	0.4380	0.4350	0.4380	0.4340	
15/32	0.4687	0.4692	0.4687	0.4692	0.4682	0.4692	0.4677	0.4692	0.4672	0.4692	0.4662	0.4692	0.4652	
1/2	0.5000	0.5005	0.5000	0.5005	0.4995	0.5005	0.4990	0.5005	0.4985	0.5005	0.4975	0.5005	0.4965	
9/16	0.5625	0.5630	0.5625	0.5630	0.5620	0.5630	0.5615	0.5630	0.5610	0.5630	0.5600	0.5630	0.5590	
5/8	0.6250	0.6255	0.6250	0.6255	0.6245	0.6255	0.6240	0.6255	0.6235	0.6255	0.6225	0.6255	0.6215	
11/16	0.7500	0.6880	0.6875	0.6880	0.6870	0.6880	0.6865	0.6880	0.6860	0.6880	0.6850	0.6880	0.6840	
3/4		0.7505	0.7500	0.7505	0.7495	0.7505	0.7490	0.7505	0.7485	0.7505	0.7475	0.7505	0.7465	
13/16		0.8130	0.8125	0.8130	0.8120	0.8130	0.8115	0.8130	0.8110	0.8130	0.8100	0.8130	0.8090	
7/8 15/16	0.8750 0.9375 1.0000	0.8755 0.9380 1.0005	0.8750 0.9375 1.0000	0.8755 0.9380 1.0005	0.8745 0.9370 0.9995	0.8755 0.9380 1.0005	0.8740 0.9365 0.9990	0.8755 0.9380 1.0005	0.8735 0.9360 0.9985	0.8755 0.9380 1.0005	0.8725 0.9350 0.9975	0.8755 0.9380 1.0005	0.8715 0.9340 0.9965	
1 1/16	1.0625	1.0630	1.0625	1.0630	1.0620	1.0630	1.0615	1.0630	1.0610	1.0630	1.0600	1.0630	1.0590	
1 1/8	1.1250	1.1255	1.1250	1.1255	1.1245	1.1255	1.1240	1.1255	1.1235	1.1255	1.1225	1.1255	1.1215	
1 3/16	1.1875	1.1880	1.1875	1.1880	1.1870	1.1880	1.1865	1.1880	1.1860	1.1880	1.1850	1.1880	1.1840	
1 1/4	1.2500	1.2505	1.2500	1.2505	1.2495	1.2505	1.2490	1.2505	1.2485	1.2505	1.2475	1.2505	1.2465	
1 3/8	1.3750	1.3755	1.3750	1.3755	1.3745	1.3755	1.3740	1.3755	1.3735	1.3755	1.3725	1.3755	1.3715	
1 1/2	1.5000	1.5005	1.5000	1.5005	1.4995	1.5005	1.4990	1.5005	1.4985	1.5005	1.4975	1.5005	1.4965	
1 5/8	1.6250	1.6255	1.6250	1.6255	1.6245	1.6255	1.6240	1.6255	1.6235	1.6255	1.6225	1.6255	1.6215	
1 3/4	1.7500	1.7505	1.7500	1.7505	1.7495	1.7505	1.7490	1.7505	1.7485	1.7505	1.7475	1.7505	1.7465	
1 7/8	1.8750	1.8755	1.8750	1.8755	1.8745	1.8755	1.8740	1.8755	1.8735	1.8755	1.8725	1.8755	1.8715	
2	2.0000	2.0005	2.0000	2.0005	1.9995	2.0005	1.9990	2.0005	1.9985	2.0005	1.9975	2.0005	1.9965	
2 1/8	2.1250	2.1255	2.1250	2.1255	2.1245	2.1255	2.1240	2.1255	2.1235	2.1255	2.1225	2.1255	2.1215	
2 1/4	2.2500	2.2505	2.2500	2.2505	2.2495	2.2505	2.2490	2.2505	2.2485	2.2505	2.2475	2.2505	2.2465	
2 3/8	2.3750	2.3755	2.3750	2.3755	2.3745	2.3755	2.3740	2.3755	2.3735	2.3755	2.3725	2.3755	2.3715	
2 1/2	2.5000	2.5005	2.5000	2.5005	2.4995	2.5005	2.4990	2.5005	2.4985	2.5005	2.4975	2.5005	2.4965	
2 5/8	2.6250	2.6255	2.6250	2.6255	2.6245	2.6255	2.6240	2.6255	2.6235	2.6255	2.6225	2.6255	2.6215	
2 3/4	2.7500	2.7505	2.7500	2.7505	2.7495	2.7505	2.7490	2.7505	2.7485	2.7505	2.7475	2.7505	2.7465	
2 7/8	2.8750	2.8755	2.8750	2.8755	2.8745	2.8755	2.8740	2.8755	2.8735	2.8755	2.8725	2.8755	2.8715	
3	3.0000	3.0005	3.0000	3.0005	2.9995	3.0005	2.9990	3.0005	2.9985	3.0005	2.9975	3.0005	2.9965	

Table 2. Minimum and Maximum Diameters of "Go" and "Not Go" Plug Gages

Size	"Go"														
	Class 6		Class 5		Class 4		Class 3		Class 2		Class 1		"Not		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$\frac{1/8}{5/32}$ $\frac{3}{16}$	0.1250 0.1562 0.1875	0.1563	0.1557	0.12465 0.15585 0.18715	0.1552	0.12415 0.15535 0.18665	0.1547	0.12365 0.15485 0.18615	0.1225 0.1537 0.1850	0.1227 0.1539 0.1852	0.1215 0.1527 0.1840	0.1530	0 15665	0 1567	
7/32 1/4 9/32	0.2187 0.2500 0.2812		0.2495	0.21835 0.24965 0.28085	0.2490	0.21785 0.24915 0.28035	0.2485	0.21735 0.24865 0.27985	0.2162 0.2475 0.2787	0.2164 0.2477 0.2789	0.2152 0.2465 0.2777	0.2155 0.2468 0.2780	0.25045	0 250	
5/16 11/32 3/8	0.3125 0.3437 0.3750	0.3438	0.3432	0.31215 0.34335 0.37465	0.3427	0.31165 0.34285 0.37415	0.3422	0.31115 0.34235 0.37365	0.3412	0.3102 0.3414 0.3727		0.3405	0.34415	0 344	
13/32 7/16 15/32	0.4062 0.4375 0.4687	0.4376	0.4370	0.40585 0.43715 0.46835	0.4365	0.40535 0.43665 0.46785	0.4360	0.40485 0.43615 0.46735	0.4350	0.4039 0.4352 0.4664	0.4340	0.4030 0.4343 0.4655	0.4379	0 438	
$\frac{1/2}{9/16}$ 5/8	0.5000 0.5625 0.6250	0.5626	0.5620	0.49965 0.56215 0.62465	0.5615	0.49915 0.56165 0.62415	0.5610	0.49865 0.56115 0.62365	0.5600		0.5590	0.4968 0.5593 0.6218	0.56298	0.563	
11/16 3/4 13/16	0.6875 0.7500 0.8125	0.7501	0.7495	0.68715 0.74965 0.81215	0.7490	0.68665 0.74915 0.81165	0.7485	0.68615 0.74865 0.81115	0.7475	0.7477	0.7465		0.68798 0.75048 0.81298	0.75	
7/8 15/16	0.8750 0.9375 1.0000	0.9376	0.9370	0.87465 0.93715 0.99965	0.9365	0.87415 0.93665 0.99915	0.9360	0.87365 0.93615 0.99865	0.9350	0.9352	0.9340	0.8718 0.9343 0.9968	0.9379	0.93	
1 1/16 1 1/8 1 3/16	1.0625 1.1250 1.1875	1.1251	1.1245	1.06215 1.12465 1.18715	1.1240	1.06165 1.12415 1.18665	1.1235	1.06115 1.12365 1.18615	1.1225	1.1227	1.1215	1.0593 1.1218 1.1843	3 1.1254	5 1.12	
1 1/4 1 3/8 1 1/2	1.2500 1.3750 1.5000	1.3751	1.3745	1.24965 1.37465 1.49965	1.3740	1.24915 1.37415 1.49915	1.3735	1.24865 1.37365 1.49865	1.3725	1.3727	1.3715		8 1.2504 8 1.3754 8 1.5004	51.37	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1.6250 1.7500 1.8750	1.7501	1.749	1.62465 1.74965 1.87465	1.749	1.62415 1.74915 1.87415	1.748	1.62365 1.74865 1.87365	1.7475	1.7477	1.7465	1.746	8 1.6254 8 1.7504 8 1.8754	5 1.75	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.0000 2.1250 2.2500	2.125	1 2.124	1.99965 52.12465 52.24965	2.124	0 1.99918 0 2.12418 0 2.24918	1.998 2.123 2.248	1.99865 2.12365 2.24865	1.9975 2.1225 2.2475	2.1227	2.121	1.996 2.121 2.246	8 2.0004 8 2.1254 8 2.2504		
2 3/8 2 1/2 2 5/8	2.3750 2.5000 2.6250	0 2.500	1 2.374 1 2.499 1 2.624	5 2.37465 5 2.49965 5 2.62465	2.374 2.499 2.624	0 2.3741 0 2.4991 0 2.6241	2.373 2.498 2.623	5 2.37365 5 2.49865 5 2.62365	2.3725 2.4975 2.6225	2.4977	2.496	5 2.371 5 2.496 5 2.621	8 2.3754 8 2.5004 8 2.6254	5 2.3 5 2.5 5 2.6	
2 3/4 2 7/8 3	2.750 2.875 3.000	0 2.875	1 2.874	5 2.74965 5 2.87465 5 2.99965	5 2.874	0 2.7491 0 2.8741 0 2.9991	5 2.873	5 2.7486 5 2.8736 5 2.9986	5 2 872	5 2.872	7 2.871	5 2.871	8 2.750 8 2.875 8 3.000	15 2.8	

is 0.0005 inch, it can be used in the next class and so on down to the class of greatest tolerance. The tolerance of the latter class is 0.004 inch.

#### Many Reamers of Slight Differences Previously in Use

Prior to the establishment of the present method of setting limits and tolerances for cylindrical holes, the judgment of the draftsmen in the engineering departments of the various plants was depended upon largely. This practice resulted in the need for enormous quantities of special reamers in the shops, because one draftsman might select 0.997 and 0.996 inch as the maximum and minimum limits for a hole of 1 inch nominal diameter on which a tolerance of 0.001 inch was desired, whereas another draftsman might specify 1.002 and 1.001 inches as the proper limits for such a hole. It was not uncommon to find a shop using forty or fifty reamers of the same nominal size but varying slightly in actual diameter.

#### An Extensive Survey Led to the New Tolerance System for Round Holes

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Before attempting to set up a system of tolerances that would remedy this condition, a thorough study was made in the various plants of the corporation to determine the performance of reamers under different normal working conditions. Parts made of cast iron, bronze, steel, aluminum, fiber, and other materials were checked as they were taken from the drilling machines, automatic screw machines, etc., in which they were reamed under actual production conditions. The reamers used in finishing the holes were also measured carefully to determine their diameter to 0.0001 inch.

Careful records were kept as to whether the parts were machined dry or whether they were flooded with cutting or soluble oils. This information was recorded on long sheets which also contained columns for the type of reamer used; the

speed of the reamer or work, in number of revolutions per minute and in circumferential feet per minute; the feed per revolution; the amount of stock removed; the diameters of the hole before and after reaming; and the amount by which the reamed hole exceeded the diameter of the tool.

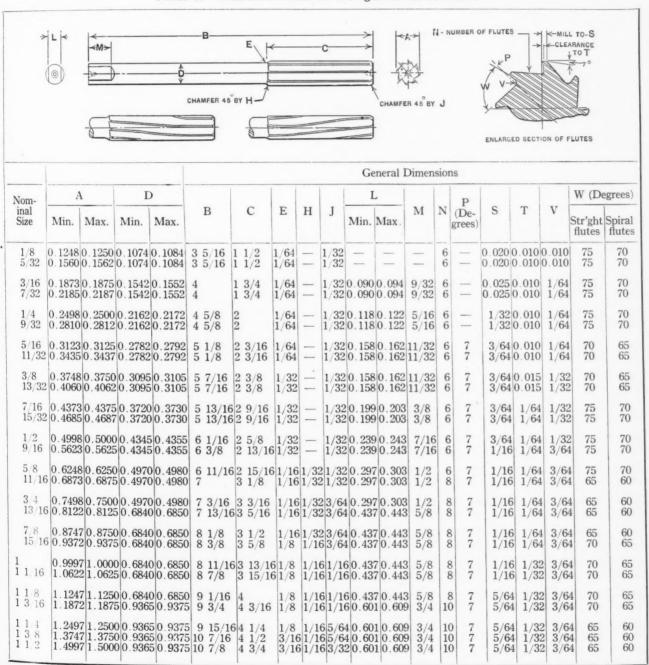
In this investigation, a set of micrometer plug gages was employed for checking the holes accurately. Over 5000 holes and the reamers used in finishing them were inspected, and the findings tabulated, during a period covering from one and one-half to two years. This research led to the important discovery that the average reamer cuts 0.0005 inch over-size; on this finding the present system of tolerances for cylindrical holes was based.

Direct results of this research were the establishment of the new system of tolerances and limits

for cylindrical holes, the standardizing of reamers for finishing holes within the specified limits, and the standardizing of gages for checking the holes. Six classes of tolerances were established, as shown in Table 1, the amount of tolerance ranging from 0.0005 inch in Class No. 6, up to 0.004 inch in Class No. 1. In each class, the maximum limit specified for any hole is 0.0005 inch greater than the nominal size, which corresponds exactly to the amount that average reamers were found to cut over-size. The minimum limit specified for each hole equals the maximum limit minus the total tolerance for that particular class.

Thus, it will be seen from Table 1 that, regardless of the class, the maximum limit is always the same for any hole of a given nominal size. Referring, for instance, to a hole of 1 inch nominal size, it will

Table 3. Standard Series of Straight-shank Reamers



be seen that the maximum limit for each class is given as 1.0005 inch, whereas the minimum limit ranges from 1.0000 inch in Class No. 6 to 0.9965 in Class No. 1. As previously mentioned, the advantage of this scheme is that any standard reamer of a given nominal size, taken from a tool-crib, will always finish a hole within the maximum limit, regardless of the tolerance class.

When new, the reamer may be used entirely for finishing holes of Class No. 6 tolerance, and as it becomes worn to a diameter smaller than the minimum limit of that class, it may be used for finishing holes of the next class and so on until it becomes smaller in diameter than the minimum limit specified for holes of Class No. 1. In other words, no reamer is ever worn out until it has been used on all six classes.

The tolerances and limits given in Table 1 are now specified for all new production parts, jigs,

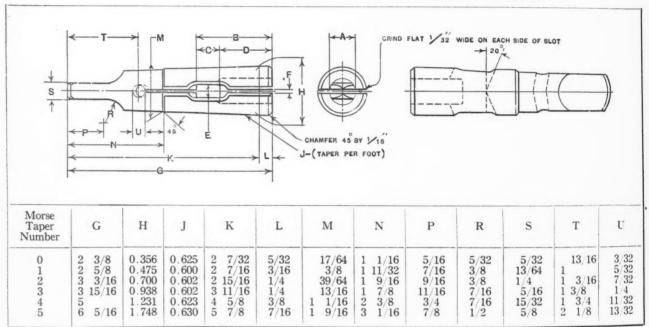
eter of the "Not Go" gage is 0.00005 inch greater than the maximum limit specified for holes of the same nominal diameter in Table 1. The tolerance allowed on the "Not Go" gages is 0.0001 inch.

On a "Go" gage of any nominal size, the minimum limit is the same as the minimum hole size for the same class of tolerance given in Table 1. The maximum limit of "Go" gages ranges from 0.0001 inch greater than the minimum limit in Class No. 6, to 0.0003 inch greater in Class No. 1.

#### Standards Set up for Reamers

Standards have also been drawn up for reamers to be purchased for use in General Motors plants. As may be seen from Table 3, the maximum diameter of the cutting portion of reamers must always correspond with the nominal diameter. This will insure that the reamer will pass through standard jig bushings and finish holes within the maximum

Table 4. Blank Dimensions of Drivers Used for Straight-shank Reamers



fixtures, and tools as they are drawn up in the engineering departments. To avoid confusion, holes of parts designed before the establishment of this system, are still finished according to the original specifications. However, as time goes on, all the plants of the General Motors Corporation will be using the new tolerance system. Any class of fit is, of course, obtainable by having the draftsmen of the engineering departments specify the limits on the male members that are to fit the holes.

#### "Not Go" Gages Alike for All Tolerance Classes

Another advantage derived from the new system of tolerances and limits for cylindrical holes is that a "Not Go" gage of any nominal size can be used for all six classes of tolerance. From the two columns at the right-hand side of Table 2, which gives the minimum and maximum diameters of plug gages for holes from 1/8 to 3 inches, inclusive, it will be seen that the maximum limit on the diam-

limits given in Table 1. The minimum limit specified for any reamer equals the maximum limit minus 0.0002 inch for reamers from 1/8 to 3/4 inch, inclusive, and minus 0.0003 inch for reamers from 13/16 to 1 1/2 inches, inclusive. The back taper may vary from 0.0002 to 0.0003 inch in the entire length of the cutting portion.

An under-cut of 7 degrees is required on the cutting faces of all reamers 5/16 inch and larger in diameter. Helical angles of right-hand spiral reamers for regular service may range from 10 to 12 degrees, and of left-hand spiral reamers, from 8 to 10 degrees. Special helical angles may be specified to meet certain conditions of manufacture.

Reamer lengths are specified to be shorter by an amount equal to the diameter than drills of the same nominal size, as they project from drill spindles. Thus, as drills used in production operations in combination with reamers are resharpened in use and gradually become shorter, the reamer

lengths correspond with the average drill lengths. Thus minimum raising and lowering of drill heads

or jigs is required.

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Drills used by the General Motors Corporation are longer than those considered standard by drill manufacturers, by amounts ranging from 1/2 to 1 times their diameter. Consequently, the reamers given in Table 3 are also longer than those considered standard by tool manufacturers. However, short reamers have been standardized for certain purposes. There are also standard four-flute reamers of both standard and short series, in sizes from 1/8 to 1/4 inch, inclusive.

Straight-shank drills and reamers are used exclusively in conjunction with General Motors drivers of the type shown in Table 4. This practice has resulted in large savings in view of the fact

## DISPLAY OF AMERICAN MACHINES IN GERMANY

The accompanying illustration shows the new show rooms for the display and demonstration of several well-known makes of American machine tools, recently opened by the firm of Georg Stenzel & Co., 16 Friedrichstrasse, Berlin, Germany. This firm began the sale of American machine tool equipment in 1924, and has since made rapid progress. It now occupies a leading position in this field, representing some of the best known American manufacturers. In the new show rooms, which have an area of about 5500 square feet, American machine tools are shown exclusively. All the machines are connected to the power supply, so that they can be demonstrated under power in a thoroughly practical fashion. This method of demonstrating Amer-



Display of American Machine Tools in the Show Room of Georg Stenzel & Co., Berlin, Germany

that drills and reamers with straight shanks can be purchased at considerably lower prices than similar tools with taper shanks. For instance, on drills from 1/8 to 1/2 inch in diameter, the savings range from 32 to 78 per cent.

Table 4 gives only the blank dimensions of the drivers. They are finished to suit each size of reamer, dimension A being made to correspond to the diameter of the reamer shank. The tolerance on this dimension is 0.001 inch for all sizes. Dimensions B, C, D, E, and F also vary with the reamer shank sizes. These drivers are used not only in conjunction with drills and reamers, but also with straight-shank counterbores, spot-facers, and similar tools.

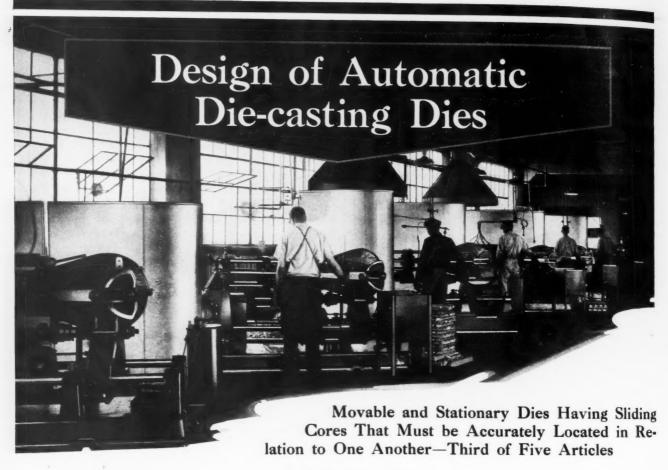
The right-hand view shows the angular milling of the driving slot. This construction provides a stop for the shank of the reamer or other tool being driven.

ican machine tools has proved very effective. It makes it possible to emphasize superior details of design in a manner that would not otherwise be possible.

#### A SERIOUS OMISSION

A machinery company writes us as follows: "One of our customers recently received a circular of a device in which they are interested, but there was no name on the circular to indicate who was the manufacturer or distributor."

It is almost impossible to understand how a manufacturer could send out a circular without his name and address on it. Nevertheless, this is not the first instance of this kind that has come to our attention. On two other occasions, we have received circulars without the manufacturer's name and address. Here is a case where it might be well to "check and double-check."



By CHARLES O. HERB

THE automatic dies used in the die-casting machines built by the Madison-Kipp Corporation, Madison, Wis., are so designed that all the sliding cores are located accurately in relation to one another. Typical methods of operating these cores were discussed in the first and second articles of this series which appeared in the May and July numbers of MACHINERY. The present article will

describe a set of dies in which a sliding core of small diameter in the movable die is required to register accurately with a similar core in the stationary die. Another feature of this die set is the use of a movable core for forming an under-cut surface in the casting. The article will also describe a set of dies for producing lead battery grids. This die set has 136 moving cores.

Continuous Hole Formed at Two Angles

Fig. 1 shows a throttle valve body for a carburetor, which is cast in

dies with the parting line running along the vertical center line of the casting, when viewed as shown in this illustration. In casting this part, the sliding cores of the movable and stationary dies must position themselves accurately against one another. The sliding core of the stationary die forms a hole in boss A that meets the hole formed in bosses B by the core of the movable die. These

cores are illustrated at *C* and *D*, respectively, in Fig. 2; the right-hand view shows the two dies together in the casting position, and the illustration at the left shows a view of the movable die face.

Core C must be slid into place after the dies have been closed for a casting operation. This core movement must take place quickly, as the molten metal is forced into the dies almost instantly when the dies are closed. Also, the core must be withdrawn before the movable die is pulled away from the

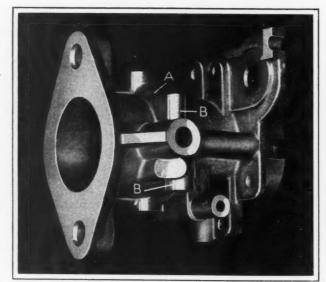


Fig. 1. Casting Produced in Dies Equipped with Eight Sliding Cores

stationary die, only enough time being allowed to elapse to permit the metal to solidify a certain amount. This core is 3/32 inch in diameter at the small end. It moves a distance of 2 inches, and therefore has considerable overhang at the point where it must meet core D, which also is but 3/32 inch in diameter at the small end.

## How the Sliding Core of the Stationary Die is Operated

The movements of core C are effected through bellcrank lever E. This lever is actuated by a rod which connects it with another bellcrank that con-

bination bar mounted at the top of the machine. The arrangement of these cam-blocks is similar to that illustrated in Fig. 4 of the first article of this series.

When slide H is pulled upward, rod K causes lever L to swivel and thus pull down block M in which core D is held. The movement of this block and of the core is about 1 3/8 inches. Fastened to the same block there is also a core N which, of course, moves simultaneously with core D. During a part of the time that block M is in action, it conveys motion to slide O to which another core is attached. Slide O moves only a distance of 5/8

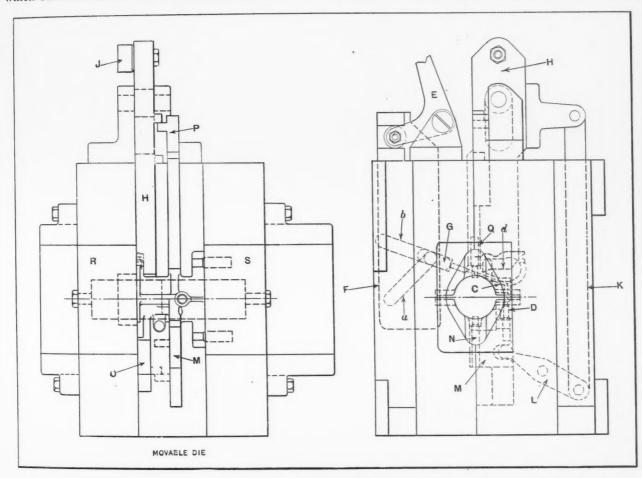


Fig. 2. Construction Details of a Die Set in which a Small-diameter Sliding Core in the Movable Die Must Register Accurately with a Similar Core in the Stationary Die

stitutes part of the regular mechanism of the machine. After a casting has been made, lever E is swiveled, which pulls slide F upward. This slide is provided with a cam groove a which is engaged by a roller fastened to holder G to which core G is attached. As a result, when slide F is raised, holder G is withdrawn along slot G in the die-block and the core is pulled back with it.

## Operating the Sliding Cores of the Movable Die

There are five sliding cores in the movable die, all of which are operated as slide H is moved up and down when the die carriage travels backward to open the dies and forward to close them. These movements of slide H are effected by roller J running along a path formed by cam-blocks on a com-

inch, the movement being controlled by two lugs on block M which come in contact with a lug on slide O. Obviously, this slide moves only when one of the lugs on block M is in contact with the lug on slide O.

At the lower end, slide H is shaped to form an under-cut surface in the casting, as indicated by the dotted lines d. Motion is also imparted to slide P by slide H through lugs similar to those employed in connection with block M and slide O. By this means, while slide H moves  $1\ 3/8$  inches, slide P moves only 1/2 inch. Attached to the lower end of slide P is a core Q which produces a hole in a boss on the casting directly on its center line.

The large hole that extends through the casting from end to end is formed by cores attached to

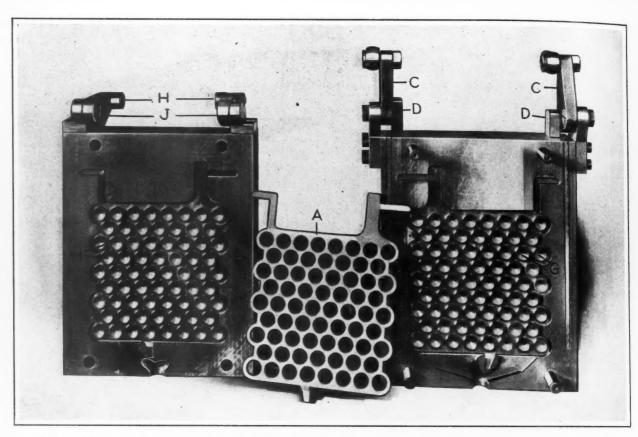


Fig. 3. Movable and Stationary Dies Equipped with Sixty-eight Sliding Cores Each for Producing the Holes in Battery Grid A

blocks R and S. These blocks slide in ways in the face of the die body and in brackets attached to the die. The blocks are pulled outward as the movable die is withdrawn from the stationary die by an arrangement similar to that used in the die described in the second article of this series. Rods extending from the blocks have rollers at their outer ends which engage cam-blocks on combination bars mounted on both sides of the machine. As the rollers move along these cam-blocks, they pull the rods, together with blocks R and S, outward. In the present example, however, one rod suffices for each block.

Thus far only the action that causes the cores to be withdrawn from the dies and blocks R and S to be pulled apart after a casting operation has been discussed; when the movable die advances toward the stationary die before an operation, the reverse action of all moving die parts is effected. The part produced in these dies measures approximately  $2\ 1/2$  by  $3\ 1/2$  by  $3\ inches$ , and weighs about 1.2 pounds. The production averages 180 pieces per hour. In casting, molten zinc is forced into the dies under a pressure of 350 pounds per square inch.

#### Die Set with One Hundred and Thirty-six Moving Cores

Movable and stationary dies with sixty-eight sliding cores each are used for casting lead battery grids of the type illustrated at A, Fig. 3. Cores are required in both dies, because a draft is allowed in the holes in both directions. The cores are moved 3/32 inch horizontally. The grids measure  $10\ 1/8$ 

by 7 3/4 inches, and are 5/16 inch thick. Approximately 1/16 inch of metal separates the different holes. These castings are produced at the rate of four per minute, the molten lead being forced into the die cavity under a pressure of 150 pounds per square inch. In Fig. 3, the stationary die is shown at the right and the movable die at the left.

The cores of the stationary die are pulled from the casting before the movable die is withdrawn at the end of an operation, to insure that the casting will stick to the cores of the movable die. Movement of the stationary die cores is effected in a manner similar to that employed in connection with the stationary die of the preceding example, two rods B, Fig. 4, being connected to bellcrank levers at the rear of the machine which are operated by the standard equipment.

When these rods are pulled to the right, as viewed in Fig. 4, the two bellcrank levers C are swiveled, thus pulling the two slides D upward. Machined in these slides are two cam slots a which are engaged by rollers E. These rollers are fastened to the ends of plate F which contains all the cores in the stationary die. With this arrangement, as slides D are raised, plate F is moved horizontally an amount equivalent to the throw of the cam grooves. This is sufficient to pull cores G out of the casting.

#### Cores of the Movable Die Operate in the Same Manner as Those of the Stationary Die

The cores of the movable die are withdrawn as the movable die carriage recedes from the stationary die and rollers H of levers J on the two sides of the die travel up the inclines of cam-blocks mounted on combination bars at the top of the machine. As this occurs, levers J swivel, thus lifting two slides K. These slides also have cam slots b similar to the cam slots in slides D, and rollers attached to plate L engage these slots. Consequently, when slides K are pulled up, plate L is shifted horizontally enough to pull cores M out of the casting.

Four pilot pins are provided on the stationary die to enter mating holes in the movable die when the dies are closed. This insures close registry of the dies. The parting line is directly in the center of the casting.

Patents have been applied for to cover the various movements described in this series of articles.

\* \* \*

Accidents to passengers and employes on American railroads have been reduced over 53 per cent in the last seven years as a result of the organized and aggressive safety work of the railroads. These figures are shown in reports issued by the Interstate Commerce Commission.

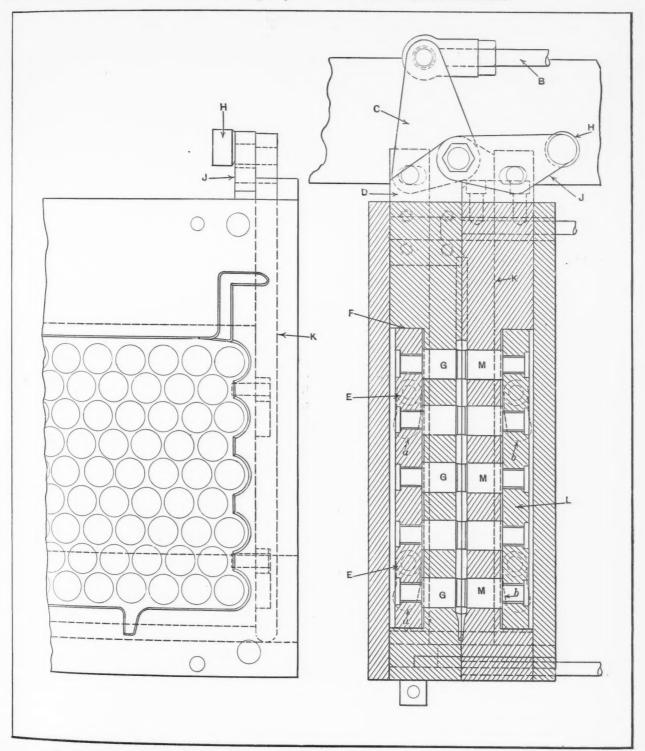


Fig. 4. Illustration Showing the Mechanism Employed for Moving the Cores of the Battery Grid Dies



Fig. 1. General View of Wing and Propeller Assembling Department

# Building the Framework of the Moth Plane

How Selected Unfinished Lumber is Transformed into Wing Structures Possessing Great Strength Combined with Light Weight

By FREEMAN C. DUSTON

SOME of the methods and equipment employed in constructing metal fuselages at the plant of the Moth Aircraft Corporation were described in April MACHINERY. The present article outlines briefly the procedure followed in building the wooden framework for the wings, fins, ailerons, and similar parts, and describes the application of the fabric covering to these elements. The "doping" and painting of the fabric are also described.

Preparing and Storing Material for Wing Frames

The great strength and rigidity exhibited by the wings of Gypsy-Moth planes in proportion to their weight and area is due not only to the design of the framework (see Fig. 3) but also to the care with which the wood is selected and the skill and thoroughness with which the parts are fitted and assembled. The material used for the framework is quarter-sawed New England white spruce. The lumber is bought in the rough and dressed to specified sizes in the woodworking department, after which it is kiln dried for a period ranging from twelve to thirty days.

When the kiln-drying operation has reduced the moisture content to a certain per cent, the material

is carefully piled in a store-room in which the temperature and humidity are kept constant. This treatment prevents the pieces from warping and keeps them in the best possible condition for shaping into finished parts as required.

Shaping Wing Beams and Webs

The wing beams A, Fig. 3, and in fact, all the wood

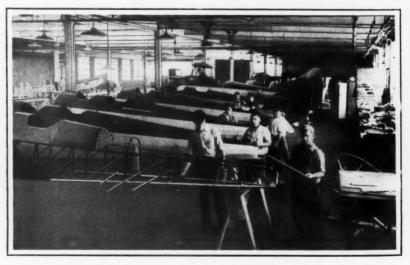


Fig. 2. View Showing Assembly Line where Certain Parts are Added to the Fuselage at Each Successive Station

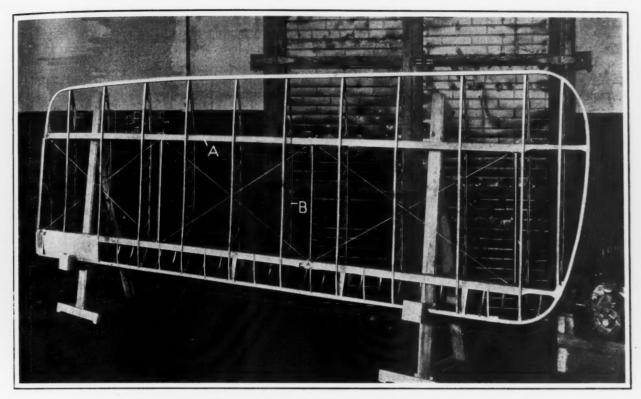


Fig. 3. Framework of Gipsy-Moth Airplane Wing Ready to Receive Fabric Covering

parts, are formed accurately to size on a routing machine. There is a jig or templet for every wood part. These templets are used in shaping the parts on the routing machine. The webs of the beams B are of ply wood construction, the laminations being joined securely together with casein glue under pressure.

Small jigs are used in assembling the webs, and larger jigs are employed in assembling the webs

on the wing beams in order to insure accurate positioning or spacing. Fig. 1 shows some of the wings being assembled on jigs mounted on work benches. At the left may be seen several of the stands used in shaping propellers. For this work, accurate contour gages are employed.

After the wooden framework and tubular steel members of a wing have been completely assembled, as shown in Fig. 3, the assembled unit is dipped in

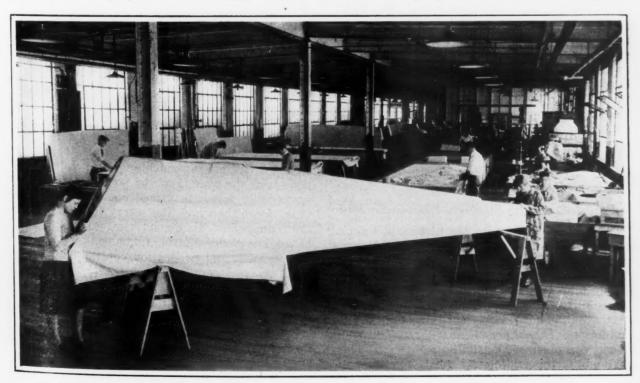


Fig. 4. Department where the Fabric Covering is Cut, Fitted, and Sewed to the Wing Frames and Fuselages

a tank containing a mixture that provides a durable protective coating.

#### Applying Fabric to Wing Frames

A corner of the room in which the fabric is fitted to the wing frames is shown in Fig. 4. In the foreground is shown a fuselage in the process of being covered. After the fabric has been securely sewed to the frame, the wing is taken to the "dope" room, where four coats of "dope" are applied by hand brushing. One coat of aluminum is then spread on, after which two coats of color are applied by spraying. A final coating is usually given the completed plane to obtain a lustrous finish.

The methods used in constructing the ailerons, stabilizers, elevators, and rudders are similar to those used in building the wings. In Fig. 2 is shown

an assembly line of fuselages. At each station of this line some part or unit is added to the assembly. For example, stabilizers are added at one station and elevators at another, wings at another, and so on until the completed plane emerges at the end of the line.

With this method of assembly, the workman at each station has an opportunity to become highly skilled in performing his own particular part of the work. As soon as a plane is moved along to the next station, another plane takes its place, so that production is continuous. One of the advantages of this method of assembling is that all units or parts of a kind are always delivered at their respective stations in the assembly line. All units and parts are interchangeable, and very little fitting is required in the assembly department.

# The Exacting Job of a Successful Foreman\*

Modern Industry Has Made of the Foreman Something More than a Gang Boss—He is Now an Important Link in the Chain of Management

By G. E. TIBBITS, Factory Manager, S. F. Bowser & Co., Inc., Fort Wayne, Ind., and Past President, National Association of Foremen

HE present industrial situation makes it more important than ever to review some of the essentials of good foremanship. First we must recognize that the basic fundamental of all industry is to make a return on the capital invested. No industry is organized without this fundamental purpose as its basis. It is sometimes stated that industry is organized only to render a service. This may be true; nevertheless, it is also true that any industry, no matter how great a service it may render, cannot continue to operate if it does not produce a return on the capital invested. We also recognize, however, that in addition to the return made to the manufacturer, or owner of the business, there must be a suitable return in the form of wages to the producers of the product, and a return in satisfactory service must be rendered to the purchaser of the product. A failure to meet any one of these conditions will also of necessity result in business failure.

The Foreman's Part in Making a Business Successful

The foreman plays an important part in securing the successful financial results of any industrial organization. He is not merely a "production getter," but must act for, and with, his management in many other responsibilities. The limits of the responsibility that the chief executive is willing to have the foreman carry rest entirely with the foreman himself. The management will be glad to have him carry as much responsibility as he can. There is no doubt of this willingness, for has not manage-

ment put into the hands of foremen great investments in material and machinery?

It has been found, for the average industry, that an investment of nearly \$5000 is required for every man on the payroll. This investment consists of buildings, machinery, tools, stock-rooms, trucks, material handling equipment, etc. Suppose the average department is composed of thirty workmen; this would mean an investment of \$150,000. To handle this amount of invested money certainly requires a man of intelligence and ability. This money must earn a return, and the foreman must invest this machinery and money to the best advantage, so as to show a profit for his department. How many of us would take \$150,000 and place it in the hands of a careless and uninterested person to invest for us and make us a reasonable profit? Therefore, when management gives the foreman its big investment in machinery and materials and adds to it the control of the workmen, a great responsibility has been placed upon him. It is true today more than ever that every foreman is really the manager of his department. This requires a broad knowledge of the fundamentals of factory management and production control.

# The Other Great Fundamental Responsibility is the Handling of Men

Another fundamental of good foremanship is to know how to interest men in their work and to get them interested in the success of the department and of the company. An uninterested man is careless, he loses time, he causes scrap, he causes accidents, and he cares little for the machinery or

<sup>\*</sup>Abstract of an address made before the annual convention of the National Association of Foremen at Toledo, Ohio, June 7.

equipment he is using; hence he is a source of loss rather than gain.

The foreman also must be a teacher-one who can instruct his men in the right way to do the various operations and to show them how to increase their skill as mechanics. He must be familiar with the fundamentals of methods of instruction and must know how men learn and how skill is attained.

Training other men requires a personality that is above criticism and that is powerful enough to influence men to do what is desired of them. Many things enter into the development of personality. A good personality, supported by practical ability on the part of the foreman, is bound to give him the control he needs over his men, so that he may accomplish the greatest possible good for both the company and the men. The foreman's personality must be such that his men will want to work with him and will be willing to do what he asks of them. How fine it is for a workman to find a man whom he is glad to follow. Such a man is indeed a leader and men will do great things for him.

The foreman should also be a friend to his men and be sincerely interested in them and in their welfare, as well as in the welfare of their families. However, he should not assume a paternalistic attitude; he should merely offer his sincere and sympathetic help to every man in his department.

The National Association of Foremen stands for education in the science of shop management and for the improvement of foremen as business managers of their departments. The Association desires that every industry make a profit and that as many men as possible be given steady employment. We have many problems to solve before we can have uniform prosperity, continuous employment, and satisfactory profits for the entire twelve months of the year. There are many problems that must be worked out in the whole scheme of foremanship development. Every group of the Association and every foremen's club is a definite part of the National Association and should be conscious of its responsibility to make the Association a success. The Association has in its membership a great many superintendents, works managers, and other executives, and these men are keenly interested in having their foremen grow and profit by all the things that the Association is trying to do.

Every foreman should take some time to check up on himself to see if he is measuring up to the full possibilities of his job. As a foreman he is getting paid for his ability to run his department at a profit to the company. This is a serious responsibility, and the foreman can do nothing better than sit down and see if he is keeping abreast of the improvements in industry and of its demands

upon him as an executive.

#### SPINDLE NOSES FOR LATHES

The National Machine Tool Builders' Association, with headquarters at 617 Vine St., Cincinnati, Ohio, states that a great many inquiries have been received relating to the status of the standardization work on spindle noses for engine lathes, turret lathes, and other machines with rotary spindles. In order that the present situation may be thoroughly understood by the industry, the following statement has been prepared:

"The different groups concerned are all represented on a standardization committee. The general committee has sub-committees representing engine lathes, turret lathes, automatic lathes, automatic screw machines, etc. A proposal submitted by the Jones & Lamson Machine Co. appealed to some builders of turret lathes and engine lathes as being somewhat better than the type they had been These companies adopted it individually, but without group action. The different groups have not yet officially endorsed any particular type of spindle nose. At present another suggestion is under consideration, and tests are being made of this construction, which seems to have some further advantages for work requiring quick changing of the chuck.

"It is not desirable to establish a national standard until and unless it is demonstrated that the construction adopted will meet all the requirements of the user in giving a firm attachment of the toolholding or work-holding elements, and also enabling the user to change these elements quickly.

"Therefore, if users ask for a 'proposed' or a 'contemplated' standard spindle nose, they should be told that any of the suggestions heretofore made may be changed before long, even though some companies now use some of these suggested forms."

It is also announced that the Spindle Nose Committee of the Association met at Detroit during the meeting of the American Society of Mechanical Engineers early in June and considered further suggestions. No conclusion was reached, but a special committee was appointed to investigate several new ideas that were suggested.

### HELPING THE CUSTOMER ORDER CORRECTLY

By JOSEPH BELL

Incorrect ordering and misunderstanding of orders cause much annoyance and expense in all lines of business. Generally accepted names for machine parts would be a great help in preventing many of these errors, and an acceptable standard nomenclature for the machinery industries would be of great value. It is not nearly so important what name is adopted as that all of us should know the same thing by the same name.

Meanwhile, manufacturers can aid in preventing mistakes and misunderstandings by providing diagrams to their customers, showing what dimensions should be given and stating the names used for parts where there might be confusion.

# Ideas for the Shop and Drafting-room

Time- and Labor-saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

#### REAMER MADE FROM DRILL ROD

A good kink to keep in mind is that a very satisfactory reamer can be made from a piece of hardened drill rod by grinding the end to the shape

End of Drill Rod Ground for Use as a Reamer

shown in the accompanying illustration. The drill rod must, of course, be of the correct size for the job. In making the reamer, the first step is to round off one end of the rod, as shown by the dotted lines in the lower view of the illustration. The piece is then hardened

and polished, after which the end is ground off at an angle as shown by the full lines.

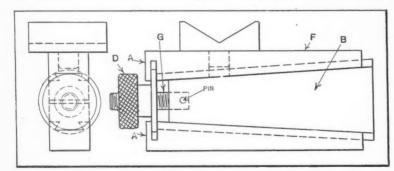
The grinding may be done free-hand, the principal requirement being that the front end of the angular surface at A be below the center or longitudinal axis of the drill rod. This type of reamer will cut accurately to size if not forced to cut too fast.

D. A. B.

#### ADJUSTABLE BLOCK FOR SETTING UP WORK

The adjustable block here illustrated is used for setting up work in various machines. By means of the adjusting knob D, work placed on either the V-block or the surface F can be raised or lowered, with no horizontal movement. The block consists of two similar plates A which are dovetailed to fit the center wedge B. As the knob is turned on the screw G, fastened in the wedge, the latter is given a transverse movement which spreads or contracts the plates.

The V-block can be removed in cases where the surface of the work to be supported is flat. This



Set-up Block which Can be Raised or Lowered by Turning a Knob

device eliminates much of the blocking ordinarily used in setting up work for machining operations, and very fine adjustments can be made by means of knob D. It can also be used effectively on the erecting floor when heavy machinery is being assembled.

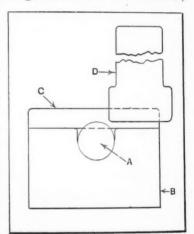
Johnstown, Pa.

CHARLES ALBRECHT

#### MARKING CYLINDRICAL WORK IN A SHAPER

A very simple and effective set of tools for marking letters, figures, etc., on round work, is shown in the illustration. The piece A to be marked is placed in a half-round groove cut in the fixture B.

the latter being fastened to the shaper table. The groove is made of sufficient size to allow the work to revolve freely within it. A plate C fastened to the top of the fixture serves to locate the work so that the marking on every piece will be the same. In the clapper box of the shaper is clamped the tool D, on the



Tools Used for Marking Cylindrical Parts in a Shaper

lower end of which the required characters are engraved.

For marking, the piece A is placed in the fixture groove. With the piece against the stop C, the ram of the shaper with the tool D moves to the left, and the projecting characters on the bottom of the tool come in contact with the outside diameter of the piece. A further movement of the ram will cause the piece to revolve in the groove, and the tool, passing over it, will impress the required marking on the cylindrical surface. To hold the tool rigidly

during an operation, the clapper box must be bolted to the shaper head. Otherwise the pressure between the work and the tool would tend to swing the latter upward and prevent it from functioning.

Boston, Mass. CHARLES R. WHITEHOUSE

### CLEANING ERASERS

On page 551 of March MACHINERY, the use of emery cloth for cleaning a soiled eraser is suggested. The writer finds that emery cloth gets dirty easily and then the

eraser becomes smudged again; besides it makes the eraser rough. It is easier to clean erasers on common drawing paper or any other rough paper. The writer has used this method for twenty years. Pontiac, Mich.

H. KURZWEIL

# FINDING THE RADIUS OF A SEGMENT OF A CIRCLE

There is a very simple solution for the problem of finding the radius of a circle when the height of

x - 2 - 4

Simple Method for Finding the Radius of a Segment of a Circle

the segment and half of the chord are known. Referring to the illustration, we have from geometrical propositions:

propositions: 2:6=6:x, or x=18. Then, radius =  $(18+2)\div 2=10$ . LEWIS D. CASTOR Elizabeth, N. J.

[A similar solution has also been submitted by Fred

G. Horton, Cleveland, Ohio.—EDITOR]

#### FLOATING REAMER-HOLDER

When a reamer-holder that is free to float in any direction at right angles to the center line of the reamer is required, the design shown in the illustration may be used. The reamer is held securely by a set-screw in the floating member B, which, in turn, is held against the surface A of the holder C by means of the spring D. The spring is supported at the left by the ring F, which is fastened rigidly in the holder, and at its right by the washer G which bears against the pin H driven through the round connecting bar I. Pin J, passing through a clearance hole in the connecting bar, is a drive fit in the ring E, which is fastened to the member E by means of the special screws E. These screws are locked in position by the short screws E.

At the other end of the bar is another ring L fastened to the holder C by the screws O, and through this ring is driven the pin M, which passes

Reamer-holder Designed to Permit a Floating Action of the Tool

through an elongated hole in the bar and serves not only to drive the tool, but also to take the pressure which would result if the reamer were to stick when removed from the work. The hole in the bar for pin M has an elongation of 1/16 inch to allow for the endwise movement of the bar that accompanies the floating movement of member B. The surfaces at A are ground and lapped to provide a smooth sliding action at this point. This type of holder may be adapted to other tools requiring a similar floating action.

Bridgeport, Conn.

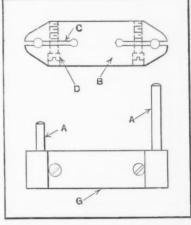
ARTHUR PONELEIT

## DEVICE FOR SETTING TOOLMAKERS' BUTTONS

A very handy device for setting or checking the location of toolmakers' buttons is shown in the accompanying illustration. The body B is made of machine or tool steel. It is drilled and reamed at each end to receive the 3/16-inch drill rods A, and

is split, as indicated at C, to permit the rods to be clamped in place by means of the screws D. After the block is machined, it is hardened and ground on the bottom surface G.

The drill rods A are made any desired length, and are simply rounded off on one end and hardened and polished. In use, these rods are set to the



Device with Adjustable Pins for Use in Setting Toolmakers' Buttons

correct height with a micrometer or vernier caliper, measuring from the base to the top of the rod. To set a toolmaker's button which has been roughly located on the work and lightly clamped in place, it is only necessary to place the work on a surface plate, turning it first on one side and then on the other, and employing the rods to set the buttons the required distance from the two sides. Of course, this method can be used only when the piece has two sides located at right angles to each other. The

base *B* serves to hold the rods in a vertical position and can be easily slid along on the surface plate. After the buttons have been tapped into the correct positions, they are secured by tightening the clamping screws. Finally, the positions of the buttons are rechecked in order to make sure that they were not displaced while they were being clamped.

DONALD A. BAKER Long Island City, N. Y.

# Questions and Answers

#### PAYING THE EMPLOYE FOR SPOILED WORK

E. G. D.—Is it required by law in all states that an employer pay an employe for time spent on spoiled work?

#### Answered by Leo T. Parker, Attorney at Law, Cincinnati, Ohio

Generally speaking, an employer and his employes are privileged to enter into contracts regarding payment for work performed by the latter. In other words, if an employe agrees to accept payment for his work based upon the quality of the work produced, and the contract provides that the workman shall receive no compensation for work that does not pass inspection, the contract is valid and enforceable. Also, a contract in which a workman agrees that his employer shall deduct from his wages the cost of material that he spoiled in performing his work is valid. This is particularly true with respect to adult employes.

However, many states have enacted laws that prohibit employers deducting from the salary of minors such charges as repairs for broken equipment, cost of material spoiled during the performance of the work, etc. These laws are intended to protect employes under age who have not attained sufficient experience to enable them to protect themselves against unscrupulous employers. Obviously, however, such laws are invalid with respect to contracts by which the employer is entitled to deduct from salary earned the cost of machinery negligently broken or material carelessly spoiled. The fact that contracts between employers and employes provide for payment of wages on the basis of piece-work does not result in the agreement being invalid but, on the contrary, this kind of contract is valid and enforceable.

#### WHAT IS VISCOSITY?

L.M.S.—Will you explain briefly what is meant by viscosity? Has it anything to do with the lubricating value of an oil?

#### Answered by H. L. Kauffman, Denver, Col.

Viscosity bears no relation to the lubricating value of an oil, but is of the utmost importance in determining the suitability of an oil for a particular purpose. Viscosity is an arbitrary measure of the "body" or relative fluidity of a liquid, and is taken as the number of seconds required for a given quantity of the fluid to flow from a standard orifice at a given temperature and under the force of gravity.

The viscosity of an oil is usually determined on the Saybolt universal viscosimeter at a temperature of either 100 or 210 degrees F. Actually, viscosity is a measure of the internal or molecular friction of the fluid. The viscosity of an oil varies with the temperature, the oil being more fluid with an increase in temperature. As it becomes more fluid, it is less able to resist rupture of the film, so that there is more danger of metallic contact being made between the journal and the bearing.

The final temperature of the oil when in use, and hence, the viscosity, is affected by factors other than speed and pressure on the bearing. That is, the heat of conduction and convection, the design and capacity of the cooling system, and the atmospheric temperature in the vicinity of the bearing all have their effect.

# LIABILITY OF BUYER FOR FREIGHT ON MACHINERY

A.M.—A manufacturing plant purchased an engine and other equipment from a machine shop in a distant state. By the terms of the contract the machine shop agreed to deliver the engine to the manufacturing plant freight prepaid. Shipment was made under a uniform bill of lading with draft Upon payment of the draft, the manuattached. facturing plant was given the bill of lading, which it presented to the railway company, and received the shipment. At this time, the local agent of the railway company informed the manufacturing plant that the freight had been prepaid according to the notations on the way bill. The manufacturing plant thereupon took possession of the ship-ment and installed it in its plant. About two months later, the railway company presented a bill to the manufacturing plant to the amount of \$350 for freight upon the shipment. It then developed that the machine shop had not paid the freight as it had agreed, and that the local agent of the railway company had been mistaken in his statement that the freight had been paid. In the meantime, the machine shop became bankrupt. Is the manufacturing plant liable to the railway company for this freight charge?

#### Answered by Leslie Childs, Attorney at Law, Indianapolis, Ind.

In view of the fact that freight charges in interstate commerce are governed by federal statute, the courts have quite uniformly held that a shipper or consignee is charged with knowledge of the lawful tariff rates, and that the carrier has a lien for this amount. Further, by statute, a carrier is forbidden to charge or receive less than the lawful rate for carriage. In line with this, any settlement of freight charges in which the carrier received less than the lawful tariff binds no one, and the carrier may thereafter proceed to collect the proper rate. In view of this, and the holdings of the federal courts on the subject, it is probable that the manufacturing plant is liable for this claim. (138 S.E. 102)

## CENTERLESS SPHERICAL GRINDING

One of the latest developments in the field of centerless grinding is the finishing of spherical work. Balls of hardened steel, cast iron, Monel metal, glass, casein, hard rubber, and Bakelite have been ground by the centerless method in sizes ranging from 1/4 to 4 inches in diameter. The advantages resulting from the centerless grinding of balls are a high degree of accuracy and finish, and uniform roundness. The roundness of the balls is held within limits of 0.0002 inch.

The fundamental principles that apply to all grinding operations performed on the centerless type of machine built by Cincinnati Grinders, Inc.,

Cincinnati, Ohio, are employed in grinding balls, although the regulating or feed wheel is arranged different-As illustrated ly. in Fig. 1, the grinding and regulating wheels are both trued radially for ball grinding. Then, also, in order to generate a true sphere on each ball, the

regulating wheel is mounted on a special collet at an angle of 12 degrees to the axis of the regulating wheel spindle. This arrangement produces a constantly varying inclination of the regulating wheel relative to the grinding-wheel axis as the regulating wheel spindle revolves.

Casein pool balls are ground by means of the simple set-up shown in Fig. 2. Each ball is placed on a work support blade in the groove of the grinding wheel. It is interesting to note that the stripe

and number of the ball are not removed in the grinding process because they are molded through the ball.

Fig. 3 shows the arrangement employed for grinding one-inch hardened steel balls. A feature of this equipment is a hydraulic loading attachment. The work is placed on two fingers of this attachment and lowered to the work-rest blade between the grinding and regulating wheels, by imparting a slight movement of the hand in-feed lever to shift a hydraulic valve. By continuing the movement of this lever, the in-feed slide is advanced toward the grinding wheel for the operation.

After the grinding has been completed, the hand-

lever is returned to the starting position, the regulating wheel backs away, the hydraulic valve is reversed, and the finished work is lifted from between the wheels to the original position.

With this particular arrangement, the work is placed in the fixture and removed manually,

but all other operations are automatic. These balls are ground in two operations, the total stock removed being from 0.008 to 0.010 inch. Roundness is held within 0.0002 inch, and the diameter within plus or minus 0.0005 inch. A production of ten pieces a minute is obtained in each operation.

A significant feature of this operation is the use of a standard machine with special attachments, which demonstrates the versatility of the centerless method of grinding.

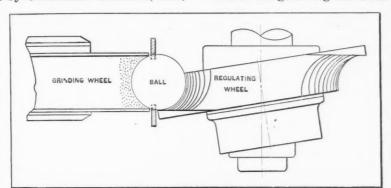


Fig. 1. How the Grinding and Regulating Wheels are Dressed and Set for Spherical Grinding

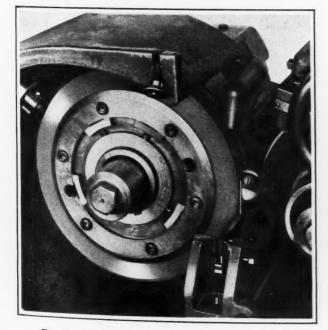


Fig. 2. Set-up for Grinding Casein Pool Balls in a Centerless Machine

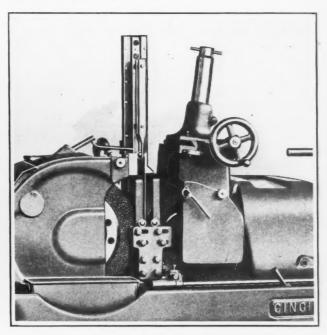


Fig. 3. Hydraulic Loading Attachment Used in Grinding Steel Balls

# How to Drill High-manganese Steel

High-manganese steel generally contains from 10 to 15 per cent manganese, 1 to 1.5 per cent carbon, and small percentages of silicon, phosphorus, and sulphur. Until recently, this tough, wear-resisting steel was considered non-machineable, and parts made from it were either cast or forged to shape. Exterior surfaces, if they had to be finished, were ground; if holes were required, they were either cored, hot-punched, or burned out with a blowtorch. The difficulties encountered in machining manganese steel have materially retarded its use. However, within the last few years, new cutting materials have been developed, including both new tool steels and cutting metals of the non-ferrous

class, that have made it possible to machine manganese steel, but drilling operations still presented great difficulties.

It is interesting to record, therefore, that drills are now manufactured which have proved themselves capable, in repeated tests under actual working conditions, to drill manganese steel satisfactorily. These drills, known as the "Hercules Major" drills, made by Whitman & Barnes, Inc., Detroit, Mich., were illustrated and described in July MACHINERY. In order to give the best results, they should be used ac-

cording to certain predetermined methods, as outlined in the following:

To drill high-manganese steel successfully, the drilling machine must have a positive feed and a speed mechanism powerful enough to drive the drill, as tremendous pressure is exerted on the tool when cutting. The work must be held securely. If a radial drilling machine is employed, the work should be placed close to the column, so as to assure maximum rigidity. If possible, the drill point should be warmed before it is used. In some instances, the manganese steel itself is heated to from 400 to 500 degrees F.

Speeds and Feeds for Drilling Manganese Steel

The peripheral speed of the drill should be between 12 and 15 feet per minute, not exceeding the latter figure. The feed should be between 0.003 and 0.010 inch per revolution. A one-inch drill gives good service with a feed of 0.006 inch and a speed of 50 revolutions per minute. No coolant or lubricant should be used.

The drill should not be allowed to "idle" or rub when a cut is started—nor after a cut has been started. For best results, the hole should be drilled through in one continuous cut. Intermittent cutting, as when a drill is used in a ratchet brace, is not recommended. At the "break through," man-

ganese steel has a tendency to "spin," which is detrimental to the drill. A heavy feed at this moment will increase the life of the drill.

#### Drilling Deep Holes in Manganese Steel

Deep-hole drilling shortens the life of the drill materially, due to the excessive heat generated. For example, in drilling a hole 3 1/2 inches deep with a 15/16-inch drill, some users obtain the best results by drilling down 2 1/2 inches in one continuous cut and then drilling five or six other holes to the same depth.

By the time this number of holes has been drilled, the metal around the first hole is cool enough to permit the drill to start a new cut, and the remaining one inch can be drilled without heating the drill to the breakdown point. On deep cuts, some users cool the drill point in oil before drilling a new hole. The practice of starting a new cut in a drilled hole and of cooling the drill in oil are exceptions to the general recommendations previously made, but this procedure has proved advantageous in the cases mentioned.

The operator should note the conditions of the cutting edges and corners of the drill as the drill-

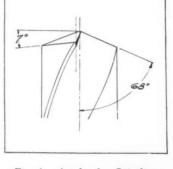


Fig. 1. Angles for Grinding Drills for Manganese Steel Drilling

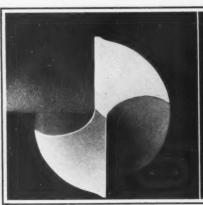


Fig. 2. Thinning the Web and Blunting the Edge of the Drill



Fig. 3. Appearance of a Drill that has been Correctly Pointed

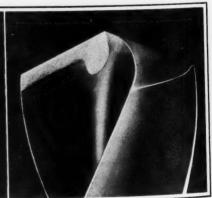


Fig. 4. Another View of Drill Point for Manganese Steel Drilling

ing proceeds. If the corners are dull 1/16 or 1/8inch back, it is advisable to remove the drill and regrind it, even though it may appear to cut satisfactorily. By so doing, the maximum number of holes per drill will be obtained, rather than a few

more holes per grind.

Drills for manganese steel are pointed rather differently from ordinary twist drills; the point angle is 68 degrees, as shown in Fig. 1, with a lip clearance of from 6 to 8 degrees. In order to reduce the rake angle and give a stronger cutting edge, a flat section is ground on the lips, as shown in Figs. 2, 3, and 4. This grinding operation also thins the web to about one-half its original thickness, or to about one-eighth of the diameter of the drill. Care should be used not to blunt the edge so that a negative rake is produced.

When a drill requires repointing, it should be given the correct angles, as indicated in Fig. 1. Fig. 2 shows the method of blunting the cutting edge and reducing the rake angle. The lip of the drill is placed against the side of a grinding wheel in such a manner that the web is thinned at the same time that the edge is blunted. The newly ground face should be parallel to the axis of the drill; or, in other words, a rake angle should be produced that is less than 90 degrees.

Figs. 3 and 4 show different views of correctly pointed drills. The "Hercules Major" drills should be ground with the same wheel and with the same care as is recommended for regular high-speed drills. Care must be taken not to discolor or burn the drill edges in grinding, and not to place the

drills in cold water to cool.

# The British Metal-working Industries

From Machinery's Special Correspondent

London, July 17

The second quarter of the present year, which has just drawn to a close, has merely served to confirm and to some extent to accentuate the tendency of the first quarter. That is to say, trade as a whole has followed a gradual downward course, which is in marked distinction to the upward trend that characterized the first six months of 1929. There is, at present, nothing to justify the suggestion which has been put forward in some quarters that we are on the eve of a protracted period of renewed depression, but it would be idle to say that the outlook for the immediate future is not fraught with some anxiety. The third quarter of the year is a slack period for most trades in normal years, and it appears probable that many firms that were able last year to tide over the summer months will be obliged to curtail their activities considerably.

The unemployment figures continue to rise, and bearing in mind the season of the year, it seems probable that they have not yet reached their highest point. However, there is reason to hope that with the coming of the Autumn months, trade will be placed on a firmer footing, and that the number of unemployed will at last show a decrease. That confidence in the future is not wanting is evidenced by the fact that the machine tool industry remains one of the best employed industries in the country.

#### The Machine Tool Industry is Fairly Well Occupied

The majority of machine tool makers still have a fair volume of work in hand, and while the outlook for the immediate future is less satisfactory than has been the case for some time, the position is almost certain to improve in the Autumn. In the meanwhile, a number of firms will welcome the opportunity of working off accumulated orders, for there is no doubt that during the past year many contracts have been lost on account of the long periods required for delivery.

The Anglo-Russian Trading Delegation has recently placed orders for machine tools to the value of £150,000 with the Associated British Machine Tool Makers Ltd., London, and other firms, this substantial contract being particularly welcome at the present time.

The automobile industry has not been such a good customer for machine tools as in recent years, and those firms that have hitherto relied largely on orders from automobile manufacturers are making strenuous efforts to find other outlets. The equipment of the new Ford Works at Dagenham, now in course of erection, will undoubtedly give an impetus to the machine tool industry.

Overseas Trade in Machine Tools Shows Increase

During May, exports of machine tools showed a marked increase in both tonnage and value, as compared with recent months, the total weight being 1442 tons, as against 1010 tons in April and 1284 tons in March, the corresponding values for the three months being £196,720, £140,130, and

Imports in May totalled 1239 tons valued at £164,612, the corresponding figures for April and March being 972 tons valued at £157,445, and 897

tons valued at £173,758, respectively.

As regards exports, May was the best month of the current year, but it still leaves the first five months substantially below the corresponding period of last year. Imports, on the other hand, are still expanding, although not so rapidly as last year, while the ton value is falling. Indeed during May the latter figure was £133, the lowest for a considerable period. In passing it is significant to note that whereas machine tool imports are steadily rising, general imports are steadily falling.

# Carboloy Tools at the White Motor Plant

The New Cutting Tools Have Been Successfully Applied by the White Motor Co. to Three Hundred Different Operations

EW industrial concerns have applied the new tungsten-carbide tools—in this case Carboloy—in as systematic a manner as the White Motor Co., and the records kept show definitely, for every operation and for every tool used, exactly what the results have been, not only as regards increased production, but also as regards costs. The life of every tool is a matter of definite record, and the number of grindings and the cost of maintenance of the tools are also definitely recorded.

Up to the present time, the company has applied

Carboloy tools to about 300 different operations. The materials cut are cast iron, malleable iron, gun iron, aluminum bronze, brass, aluminum, and a few cases of steel. Of all the operations on which thorough tests have been made up to the present time, the average increase in production in machining cast iron has been from 30 to 40 per cent, counting floor-tofloor time. The tool cost, including all expenses, has been about the same or slightly less than with the tools formerly used. In the case of the steel drums, the production increase has been 17 per cent. A complete record of tool cost is not avail-

able in this case, as Carboloy has not been applied to this work for a sufficiently long time to make a definite comparison between the former and the present tool costs.

## How Carboloy Tools were First Introduced in the Plant

As soon as the engineers of the White Motor Co. learned of the unusual characteristics of tungstencarbide tools, they immediately concluded that where these tools would apply, a material increase in production could be effected, while the quality of the product was maintained or even improved. A few typical jobs were selected, including the piston and the clutch wedges. Both parts had been causing the factory considerable trouble, as it had been found difficult to obtain the required finish. The trouble was due entirely to the fact that the cutting tools employed lost their keen cutting edge. Carboloy tools were applied to the work and the

difficulties formerly experienced vanished; in addition, a much longer tool life between grindings was recorded.

As further experiments were carried out, it became obvious that in order to apply Carboloy tools on a large scale, an entirely new system for the recording and distribution of tools would be required. Tungsten-carbide tools are too expensive to handle in the same manner as ordinary steel tools, and the first step taken was to institute a system for keeping a tool record.

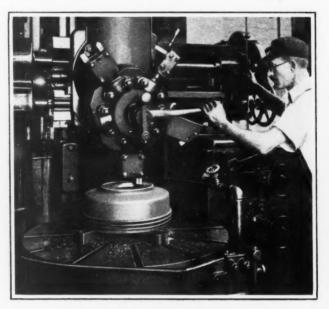


Fig. 1. Machining Gun-iron Brake-drums with Carboloy Tools at the Rate of About 5.5 Pieces per Hour; Number Machined per Tool Grind: Roughing, 300; Finishing, 1500

#### Records Kept of Tungsten-Carbide Tools

Tools are ordered to suit each particular job. As the tools come in, they are stamped with consecutive numbers and a tool record card bearing the same number is provided. This record card gives the following information: Part number and name for which the tool is to be used; material to be machined, operation to be performed, operation number, size of tool, a brief description of the type of tool, grade of Carboloy in the tool; date when tool was issued to shop; date when returned; length of life of tool; and original cost of tool.

In addition, a record is kept of the number of regrindings required for the tools. This card specifies the tool number as stamped on the tool; the department number where the tool is used; name of part, material, operation, and operation number; name of operator using the tool; and the same information regarding tool size, type, grade, date issued and date returned, as was recorded on the tool record card. In addition, the regrinding record card gives the number of pieces machined between grindings, and also has space for remarks regarding the tool that may be of permanent interest.

#### Applying Carboloy Tools to New Jobs

When the application of the new tools to a job is to be tested, the following procedure is adhered to: First, a test is made of the tools that have previously been used for the work. These tools are tested to destruction by applying a speed high enough to cause them to fail. When that speed has

been reached, Carboloy tools are substituted and are first run at this limiting speed for the former tools. The feed used in the past is generally retained, but the speed is gradually increased until a point has been reached that is the most economical speed to use, length of tool life as well as capacity of the machine tool being considered.

These tests are first made by the research engineer and are then

checked by the time-study department, a complete record being made of all the facts ascertained. On this record, the following information is given: Name and number of part; operation and operation number, as well as character of cut (for example, diameter of work); kind of material; condition of casting; coolant being used; number of department where work is done; number of machine on which it is performed, and name and size of machine.

Then, from the actual tests, the speed used for roughing and finishing, the feed employed, and the number of pieces per grind are recorded both for the tools previously used and for the Carboloy tools. From this data, in turn, are obtained the standard machining time per piece and the number of pieces per hour, the percentage of increase in production, and the actual saving in direct labor—in dollars—for a given number of pieces.

These tests are being made for every application of Carboloy, and the new tools are not applied in

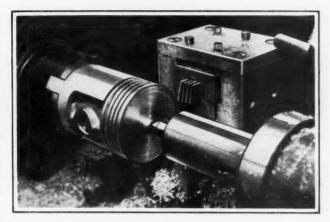


Fig. 2. Grooving Lynite Pistons; Pieces Machined per Tool Grind: 5000

regular production to any job before a complete comparison of production and cost has been made in this way.

Examples of Some of the Results Obtained

It may be of interest to record some of the results of these tests. In some instances, they have been astonishing. The facing of the top of the cylinder bores in the cylinder block is an example. With the tools formerly

used, which were the best that the company had been able to obtain in the past, only eight facing operations could be performed for each grinding of the tools. With Carboloy, 1000 cylinder bores were faced. The total life of the former tools was 240 facing operations; the total life of the Carboloy tools was 30,000 operations. For a production schedule, for which formerly 46 tools were used up, one tool now suffices, and that tool is by no means worn out at the end of the total run. Where formerly 1387 regrindings were required, 10 are now sufficient.

#### Some Interesting Cost Comparisons

While the total tool cost for the job just described was formerly \$288, it is now \$32.50. The former grinding cost was \$693.50, as against \$5 with Carboloy. This means that the total former cutting tool cost was \$981.50, as against \$37.50 at the present time, which represents a total saving for a given

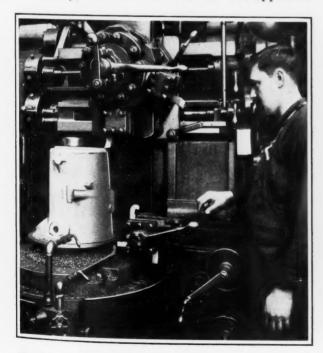


Fig. 3. Finish-turning and Facing Flange of Transmission Case, Rough-boring, and Roughing and Finishing Rear End; Pieces Machined per Grind: Roughing, 75

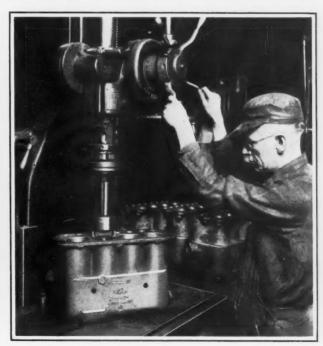


Fig. 4. Facing Combustion Chambers—Another Example of the Application of Carboloy Tools in the White Motor Plant; Pieces Finished per Grind: 1000

production schedule on the facing operation on cylinder bores of \$944.

On gun-iron brake-drums, the number of parts per grind was formerly 15, and with Carboloy, 300. The total number of brake-drums for the life of the tool was formerly 250, as against 6000 with Carboloy. While the cost of the cutters or tools used per set was only \$18 in the past, and is \$227 with Carboloy, nevertheless, the annual tool cost for Carboloy is \$750 less than for the cutting material formerly used. The savings indicated are greater than the average, but are selected as specific examples of what has been accomplished in outstanding instances.

## Cutting Speeds and Feeds that have been Found Suitable

In machining gun iron, the average roughing speed that has given best results is from 150 to 175 feet per minute, with finishing speeds varying from

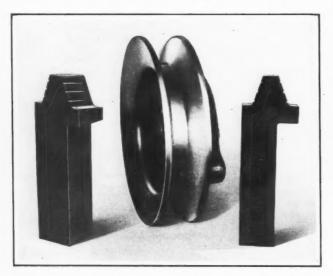


Fig. 5. Fan Driving Pulley and Carboloy Tools; Pieces Machined per Grind: Roughing, 300; Finishing, 1500

250 to 300 feet per minute. Feeds have not, as a rule, been increased over those formerly used. In turning and boring operations on cast iron, roughing feeds of approximately 0.033 inch are frequently used, with finishing feeds often as high as this, but sometimes reduced to from 0.015 to 0.020 inch.

While Carboloy tools have been applied to a great many operations, including milling, the majority of applications are for turning and, especially, for boring mill work.

#### Care Necessary in Using Carboloy Tools

For the successul application of tungsten-carbide tools in general, the following instructions have been issued at this plant:

- 1. The tools should have a minimum overhang in the toolpost and should be given all available support.
- 2. The special wheels furnished for grinding tungsten-carbide tools should be used; other wheels will injure the cutting edge.
- 3. The wheel-spindle on the grinder must run true and be free from excessive vibration.

- 4. The grinding wheel must be dressed frequently to avoid glazing and heating of the tungstencarbide tip.
- 5. While grinding tungsten-carbide tools, they must not be dipped in water.
- 6. In grinding, only a light pressure should be exerted on the tool and it should be moved across the cutting face of the wheel, thus avoiding injury of the tool and prolonging the life of the wheel.
- 7. In sharpening tools, the original clearance should be maintained, and the surface should be kept free from wheel marks; honing after grinding is recommended.

At the company's plant, all tools are reground in the department tool-crib by a man whose work consists solely in grinding Carboloy tools.

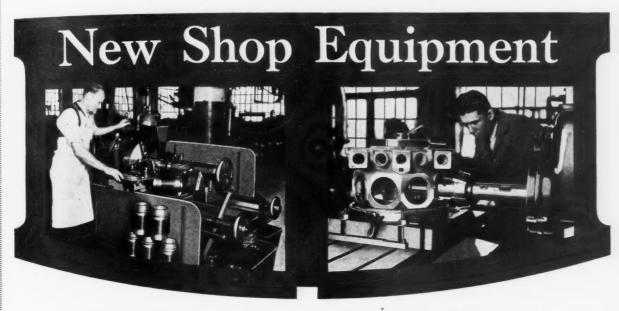
### Conclusions on the Application of Carboloy Tools

The engineers of this company state that the results they have obtained in the experiments with Carboloy tools have exceeded their expectations. They did not think that it would be possible to increase production as much as has been done, except, possibly, at an increase in tool cost; but, they have found that in no case has it been necessary to increase the tool cost, and, in a great many instances, the cost of tools, including regrinding, has been materially decreased, as indicated by the examples previously referred to. It is also the impression of the engineers of this company that the biggest savings may not be obtained necessarily through excessively high cutting speeds, but rather through the use of more moderate cutting speeds with the accompanying long tool life and the completion of a great many pieces between grinds. The latter factors really constitute the most conspicuous savings that have been made.

#### STABILIZING AN INDUSTRY

Permanent employment is a matter equally important to management and employes. In one large industry in Cincinnati, a plan has been evolved that has been in operation for several years by which employment is guaranteed to the workers for fortyeight weeks out of each year. According to a bulletin of the National Business Survey Conference, Washington, D. C., the head of the firm that has made this radical departure says: "We stabilized our work and guaranteed employment to our men not as a philanthropic thing but as a practical economic measure. We did not need to educate the dealers. They were glad to order their year's supply when we offered to store it in our own warehouse and present the bill only when it was delivered. It enables us to determine our yearly output and distribute its manufacture throughout the year.

"Others say they cannot do it—that their problems are different. Each business is different, I grant, but each is capable of being stabilized; and once stabilized, it will be found, as we have found, that the cost of production goes down sharply."



A Monthly Record of the Latest Developments in Metal-working Machinery, Small Tools, and Work-handling Appliances

## MOLINE STEEL-CONSTRUCTED MULTIPLE-SPINDLE DRILLING MACHINE

The No. 8 multiple-spindle rail-type drilling machine manufactured by the Moline Tool Co., Moline, Ill., has been built for a good many years in lengths from 4 to 10 feet with all main parts

made of gray iron. In order to meet the demand for a lighter machine of greater length, this machine has recently been constructed in a 14-foot length with all the principal frame members made of steel, excepting the columns, which are of cast iron. This construction is considerably lighter and yet stronger than the gray iron construction, and it eliminated the necessity of making patterns, an advantage which enabled the machine to be built in record time.

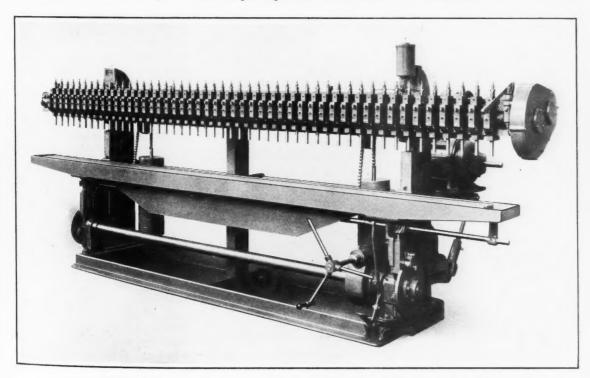


Fig. 1. Moline Steel-constructed Drilling Machine with Forty-nine Spindles

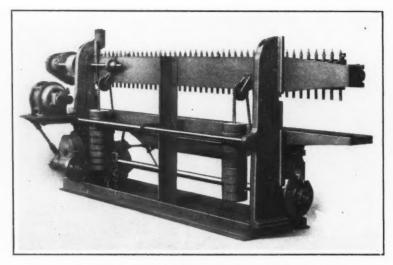


Fig. 2. Rear View of Multiple-spindle Drilling Machine, Showing the Steel Construction

Forty-nine spindles are furnished on the 14-foot machine, the minimum distance between the individual spindles being 1 1/2 inches, and the maximum distance between the end spindles, 14 feet. The base is made of boiler plate, and has angleirons welded along the edges to provide stiffness. Both ends are built up with small box-section pads for bolting the columns in place.

The table is constructed of an I-beam, the web of which serves as the bottom of the water-pan. The ends are closed with plates welded in place, and cross-members welded in place furnish pads for mounting the knee. Cast-iron sections are bolted and welded to the center of the table to provide a T-slotted working face. A rib

welded to the bottom of this unit gives the construction the necessary rigidity. The rail on which the spindle-heads are mounted is constructed of an H-section welded to a large piece of boiler plate. Gray iron castings fitted into the H-beam and bolted and welded in place provide for mounting the spindle units and furnish a continuous bearing for the main driving spiral. This rail unit was machined after all welding had been completed. As will be seen in Fig. 2, the rail is tied to the base at the middle by an angleiron. This construction strengthens the entire machine.

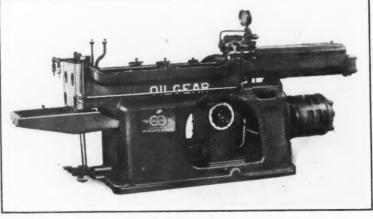
Except for the steel construction described, this machine is of the standard cam-feed type built by the company. It is equipped with a motor drive and with pick-off gears for both the drive and the feed. Although the particular machine illustrated is 14 feet long, a machine of almost any length can be furnished.

### OILGEAR HORIZONTAL BROACHING MACHINE

The Oilgear Co., 667 Park St., Milwaukee, Wis., is introducing to the trade a "Twin Twelve" horizontal broaching machine that differs considerably in construction from the "Twin Ten" broaching machine which it supersedes. The new machine operates at higher pulling and return speeds, and provides for finishing parts to closer limits. It is adapted for high-speed broaching of small and medium sized parts, especially many parts used in the automotive and airplane industries.

The power unit consists of a Type WG-6 valve delivery pump. which is mounted in the frame as an integral part of the machine. This pump is operated at a maximum speed of 860 revolutions per minute, and has a maximum delivery of 4800 cubic inches of oil per minute, at a working pressure of 1000 pounds per square inch and a peak pressure of 1250 pounds per square inch. Automatically operated relief and by-pass valves protect the pump, broaching machine, work, and tools from overloads. A convenient handwheel on the pump controls the amount of oil delivered and the speed of the draw-heads.

Either a simple manually operated broach control or a combined control for automatic or manual operation can be provided. The control is located conveniently and leaves both the operator's hands free. With the manual control there are two foot-treadles at the front of the machine, which are used for starting or reversing the drawheads at any point of the stroke. A convenient hand-lever also permits of starting and stopping the drawheads instantly. An ad-



"Oilgear" High-speed Broaching Machine for Work of Small or Medium Size

## **MACHINERY'S DATA SHEETS 183 and 184**

## REVOLUTIONS PER MINUTE FOR HIGH CUTTING SPEEDS\*-1

Diameter, Inches		Cutting Speed, Feet per Minute														
	210	220	230	240	250	260	270	280	290	300	810	320	830	340	360	380
D							Rev	olutions	per Mir	nute	14		+			
2	401.1	420.2	439.3	458.4	477.5	496.5	515.7	534.8	553.9	573.0	592.1	611.2	630.3	649.4	687.5	725.
2 1/8	377.5	395.4	413.4	431.3	449.4	467.3	485.3	503.2	521.2	539.2	557.2	575.1	593.1	611.1	647.1	683.
2 1/4	356.5	373.5	390.4	407.4	424.4	441.4	458.4	475.3	492.3	509.3	526.3	543.3	560.2	577.2	611.2	645.
2 3/8	337.7	353.8	369.9	386.0	402.1	418.1	434.2	450.3	466.4	482.5	498.5	514.6	530.7	546.8	579.0	611.
2 1/2	320.8	336.1	351.4	366.7	381.9	397.2	412.5	427.8	443.1	458.3	473.6	488.9	504.2	519.4	550.0	580.
2 5/8	303.1	320.1	334.6	349.2	363.7	378.3	392.8	407.4	422.0	436.5	451.0	465.6	480.1	494.7	523.8	552.
2 3/4	291.7	305.5	319.5	333.3	347.3	361.1	375.0	388.9	402.8	416.7	430.6	444.4	258.4	472.3	500.0	527.
2 7/8	279.0	292.3	305.5	318.8	332.1	345.4	358.7	372.0	385.2	398.5	411.8	425.1	438.4	451.7	478.2	504.
3	267.4	280.1	292.8	305.6	318.3	331.0	343.7	356.4	369.2	382.0	394.6	407.4	420.1	432.8	458.3	483.
3 1/8	256.6	268.9	281.1	293.3	305.5	317.8	330.0	342.2	354.4	366.7	378.9	391.0	403.3	415.6	440.0	464.
3 1/4	246.8	258.5	270.3	282.0	293.8	305.5	317.3	329.0	340.8	352.5	364.3	376.1	387.8	399.6	423.1	446.
3 3/8	237.6	248.9	260.3	271.6	282.9	294.2	305.5	316.8	328.2	339.5	350.8	362.1	373.4	384.7	407.4	430.0
3 1/2	229.1	240.0	251.0	261.9	272.8	283.7	294.6	305.5	316.4	327.3	338.0	349.2	360.1	371.0	392.8	414.
3 5/8	221.2	231.8	242.3	252.8	263.4	273.9	284.5	295.0	305.5	316.1	326.6	337.2	347.7	358.2	379.3	400.0
3 3/4	213.9	224.0	234.2	244.4	254.6	264.8	275.0	285.2	295.3	305.5	319.1	325.9	336.1	346.3	366.6	378.
3 7/8	206.9	216.8	226.7	236.5	246.4	256.2	266.1	275.9	285.8	295.7	305.5	315.4	325.2	335.1	354.8	374.
4	200.5	210.0	219.6	229.1	238.7	248.2	257.8	267.3	276.9	286.4	296.0	305.5	315.1	324.6	343.7	362.
4 1/4	188.7	197.7	206.7	215.6	224.6	233.6	242.6	251.6	260.6	269.6	278.6	287.5	296.5	305.5	323.5	341.
4 1/2	178.2	186.7	195.2	203.7	212.2	220.6	229.1	237.6	246.1	254.6	263.1	271.6	280.1	288.6	305.5	322.
4 3/4	168.8	176.9	184.9	192.9	201.0	209.0	217.1	225.1	233.1	241.2	249.2	257.3	265.3	273.4	289.4	305.
5	160.4	168.0	157.7	183.3	190.9	198.6	206.2	213.9	221.5	229.1	236.8	244.4	252.1	259.7	275.0	290.
5 1/4	152.7	160.0	167.3	174.6	181.8	189.1	196.4	203.7	210.9	218.2	225.5	232.8	240.1	247.3	261.9	276.
5 1/2	145.8	152.7	159.7	166.6	169.4	180.5	187.5	194.4	201.4	208.3	215.2	222.2	229.1	236.1	250.0	263.
5 3/4	139.5	146.1	152.7	159.4	166.0	172.7	179.3	186.0	192.6	199.2	205.9	212.5	219.2	225.8	239.1	252.
6	133.6	140.0	146.4	152.7	159.1	165.5	171.8	178.2	184.6	190.9	197.3	203.7	210.0	216.4	229.1	241.
6 1/4	128.3	134.4	140.5	146.6	152.7	158.8	165.0	171.1	177.2	183.3	189.4	195.5	201.6	207.7	220.0	232.
6 1/2	123.4	129.2	135.1	141.0	146.9	152.7	158.6	164.5	170.4	176.2	182.1	188.0	193.9	199.8	211.5	223.
6 3/4	118.8	124.4	130.1	135.8	141.4	147.1	152.7	158.4	164.1	169.7	175.4	181.0	186.7	192.3	203.7	215.

<sup>\*</sup>The high cutting speeds included in this table apply to work performed with tungsten-carbide tools,

MACHINERY'S Data Sheet No. 183, New Series, August, 1930 Contributed by H. W. Richardson

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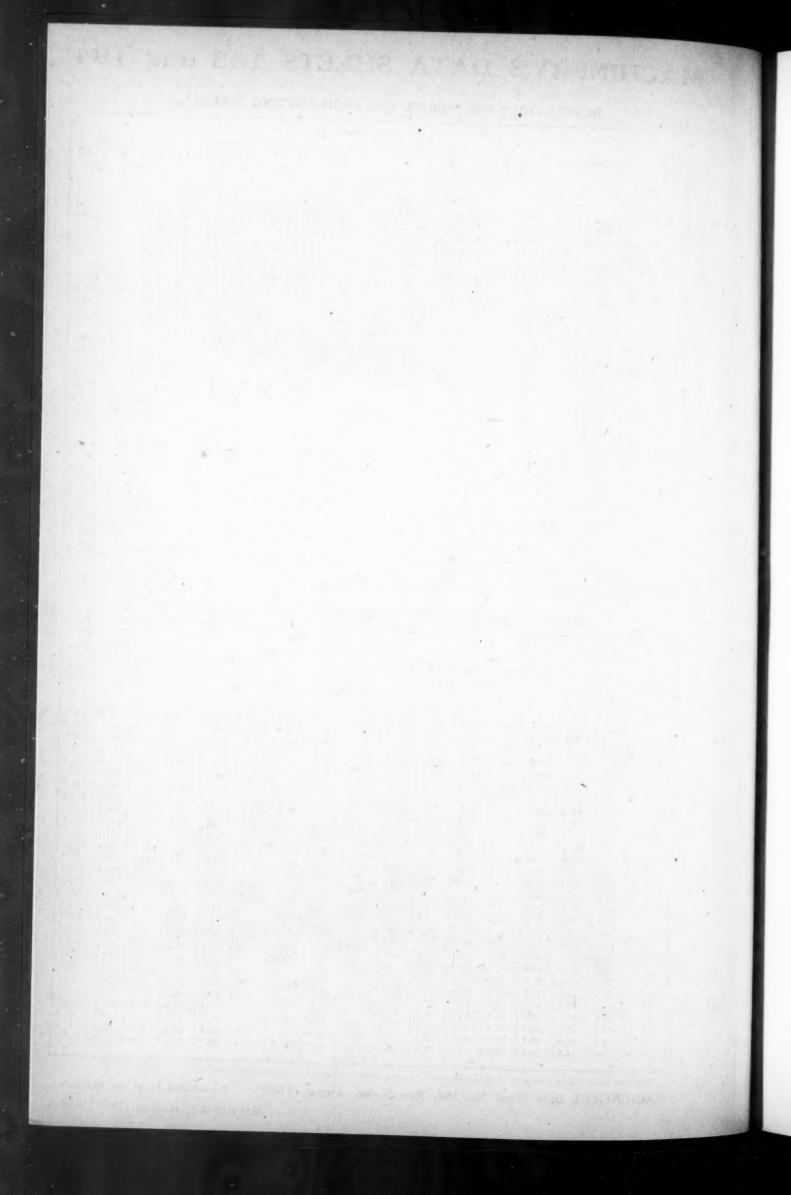
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#### REVOLUTIONS PER MINUTE FOR HIGH CUTTING SPEEDS\*-2

Diameter, Inches	. `						Cutting	Speed, 1	eet per	Minute													
	210	220	230	240	250	260	270	280	290	300	310	320	830	340	360	38							
D							Rev	olutions	per Min	nute				-		-							
7	114.5	120.0	125.5	130.9	136.4	141.8	147.3	152.7	158.2	163.7	169.1	174.6	180.0	185.5	196.4	207							
7 1/4	110.6	115.9	121.1	126.4	131.7	136.9	142.2	147.5	152.7	158.0	163.3	168.5	173.8	179.1	189.6	200							
7 1/2	106.9	112.0	117.1	122.2	127.3	132.4	137.5	142.6	147.6	152.7	157.8	162.9	168.0	173.1	183.3	193							
7 3/4	103.5	108.4	113.3	118.2	123.2	128.1	133.0	138.0	142.9	147.8	152.7	157.7	162.6	167.5	177.4	187							
8	100.2	105.0	109.8	114.5	119.3	124.1	128.9	133.6	138.4	143.2	148.0	152.7	157.5	162.3	171.8	181							
8 1/4	97.2	101.8	106.4	111.1	115.7	120.3	125.0	129.6	134.2	138.8	143.5	148.1	152.7	157.4	166.6	175							
8 1/2	94.3	98.8	103.3	107.8	112.3	116.8	121.3	125.8	130.3	134.8	139.3	143.7	148.2	152.7	161.7	170							
8 3/4	91.6	96.0	100.4	104.7	109.1	113.4	117.8	122.2	126.5	130.9	135.3	139.6	144.0	148.4	157.1	165							
9	89.1	93.3	97.6	101.8	106.1	110.3	114.5	118.8	123.0	127.3	131.5	135.8	140.0	144.3	152.7	161							
9 1/2	84.4	88.4	92.4	96.4	100.5	104.5	108.5	112.5	116.6	120.6	124.6	128.6	132.6	136.7	144.7	152							
10	80.2	84.0	87.8	91.6	95.4	99.3	103.1	106.9	110.7	114.5	118.4	122.2	126.0	129.8	137.5	148							
10 1/2	76.3	80.0	83.6	87.3	90.9	94.5	98.2	101.8	105.4	109.1	112.7	116.4	120.0	123.6	130.9	138							
11	72.9	76.3	79.8	83.3	86.8	90.2	93.7	97.2	100.7	104.1	107.6	111.1	114.5	118.0	125.0	131							
11 1/2	69.7	73.0	76.3	79.7	83.6	86.3	89.6	93.0	96.3	99.6	102.9	106.2	109.6	112.9	119.5	126							
12	66.8	70.0	73.2	76.3	79.5	82.7	85.9	89.1	92.3	95.4	98.6	101.8	105.0	108.2	114.5	120							
12 1/2	64.1	67.2	70.2	73.3	76.3	79.4	82.5	85.5	88.6	91.6	94.7	97.7	100.8	103.8	110.0	110							
13	61.7	64.6	67.5	70.5	73.4	76.3	79.3	82.2	85.2	88.1	91.0	94.0	96.9	99.8	105.7	11							
13 1/2	59.4	62.2	65.0	67.9	70.7	73.5	76.3	79.2	82.0	84.8	87.7	90.5	93.3	96.2	101.8	10							
14	57.2	60.0	62.7	65.4	68.2	70.9	73.6	76.3	79.1	81.8	84.5	87.3	90.0	92.7	98.2	10							
14 1/2	55.3	57.9	60.5	63.2	65.8	68.4	71.1	73.7	76.3	79.0	81.6	84.2	86.9	89.5	94.8	10							
15	53.4	56.0	58.5	61.1	63.6	66.2	68.7	71.3	73.8	76.3	78.9	81.4	84.0	86.5	91.6	9							
16	50.1	52.5	54.9	57.2	59.6	62.0	64.4	66.8	69.2	71.6	74.0	76.3	78.7	81.1	85.9	9							
18	44.5	46.6	48.8	50.9	53.0	55.1	57.2	59.4	61.5	63.6	65.7	67.9	70.0	72.1	76.3	8							
20	40.1	42.0	43.9	45.8	47.7	49.6	51.5	53.4	55.3	57.2	59.2	61.1	63.0	64.9	68.7	7							
22	36.4	38.1	39.9	41.6	43.4	45.1	46.8	48.6	50.3	52.0	53.8	55.5	57.2	59.0	62.5	6							
24	33.4	35.1	36.6	38.1	39.7	41.3	42.9	44.5	46.1	47.7	49.3	50.9	52.5	54.1	57.2	6							
30	26.7	28.0	29.2	30.5	31.8	33.1	34.3	35.6	36.9	38.1	39.4	40.7	42.0	43.2	45.8	4							
36	22.2	23.3	24.4	25.4	- 26.5	27.5	28.6	29.7	30.7	31.8	32.8	33.9	35.0	36.0	38.1	4							

<sup>\*</sup>The high cutting speeds included in this table apply to work performed with tungsten-carbide tools.



justable cam stops the heads automatically at the end of the stroke. The stroke can be easily changed to suit the work and tools.

The machine illustrated is equipped with the combined automatic and manual control which permits the draw-heads to be operated either continuously or semi-automatically. A control lever mounted on the side of the frame is manipulated to start and stop the draw-heads. The control mechanism operates a valve which reverses the flow of oil from the pump to the cylinders. The machine will stop automatically the instant that the maximum capacity is reached.

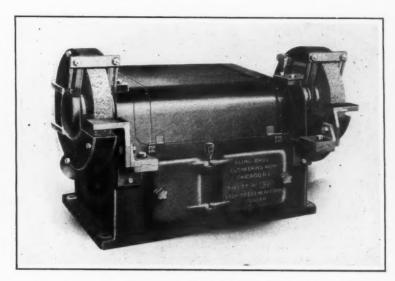
General specifications of this equipment are as follows: Normal pulling capacity, 12,000 pounds; peak pulling capacity, 15,000 pounds; pulling speed, from 48 to 396 inches per minute; stroke, from 6 to 36 inches; distance between draw-heads, 10 inches; vertical adjustment of cross-heads above or below center line, 1 1/4 inches; and net weight of motor-driven machine, approximately 4800 pounds.

### KLING HIGH-SPEED HEAVY-DUTY GRINDERS

A line of high-speed heavyduty grinders called the "Series T" has recently been placed on the market by the Kling Bros. Engineering Works, 1300 N. Kostner Ave., Chicago, Ill. The line consists of three sizes which are equipped with 18- by 2-inch. 24- by 3-inch, and 30- by 4-inch wheels, respectively. These machines are driven by a motor mounted at the rear instead of below. It is claimed that this construction provides greater accessibility and simplifies adjustments.

An important feature of the construction is that the wheelshaft is split and connected by means of a rigid bolted coupling. The coupling can be removed for replacing the V-belts quickly. This feature eliminates the necessity of tearing down the machine for belt replacement.

Another important time- and labor-saving device is the quick speed-change sheave arrange-



Kling Heavy-duty Crinder with Split Wheel-shaft which Facilitates Belt.Replacements

ment. There is also a safety device which prevents the wheels from being run at higher speeds than those recommended. This consists of a cam and lever movement actuated from the spark guards. When the spark guards are lowered to compensate for

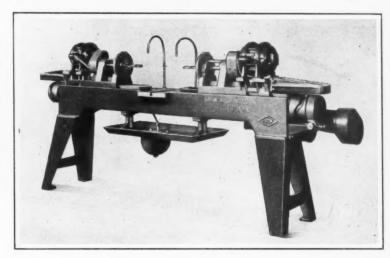
wheel wear, the motor base slides forward and thereby makes possible the mounting of the next size of sheave. The spark guards cannot be raised for mounting new wheels until the motor has been returned to the slow-speed position.

#### FREW DUPLEX HORIZONTAL DRILLING MACHINE

A No. 00-C duplex horizontal machine designed for drilling and reaming the opposite ends of metal products has been added to the line of equipment built by the Frew Machine Co., 132 W. Venango St., Philadelphia, Pa. Movement of the two heads is controlled mechanically

by cams at each end of the bed, and the operator simply has to load and unload the work fixture.

Each head has a separate motor for driving the spindle, while a third motor feeds the heads along the bed. Running through the bed there is a shaft which turns in Timken bearings and



Frew Machine for Drilling and Reaming Opposite Ends of Work

carries a cam at each end. This camshaft is driven by worm-gearing through gear reductions and pick-off change-gears that provide for varying the rate of feed. The feed motor is mounted on a bracket at the back of the bed and is geared to the worm-gear unit.

Attached to the rear of each head is a cam slide which carries

a cam-block that is adjustable for varying the distance between the spindle ends. A large flat surface on the front end of the head units permits the application of multiple-spindle heads. The spindles are carried in Timken bearings and are provided with No. 3 Morse tapers. The fixture plate in the center of the bed has T-slots in it.

are controlled by a single lever directly in front of the operator. All actuating screws are provided with micrometer dials graduated to read in thousandths of an inch.

A vertical milling attachment can be applied to the machine, provision for its application being made when the machine is built so that the attachment can be added at any time.

### JONES HIGH-SPEED HORIZONTAL BORING MILL

In a horizontal boring, milling, and drilling machine recently developed by the Jones Machine Tool Works, Inc., 53rd and Lansdowne Ave., Philadelphia, Pa., liberal use of anti-friction bearings throughout the machine permits high spindle speeds and eliminates radial and end play of the spindle and of all fast moving shafts. All spindle-driving and fast moving shafts are mounted in ball and roller bearings, while all shafts in the feed and speed gear-boxes are mounted in Timken bearings. spindle sleeve is mounted in exceptionally large Timken bearings.

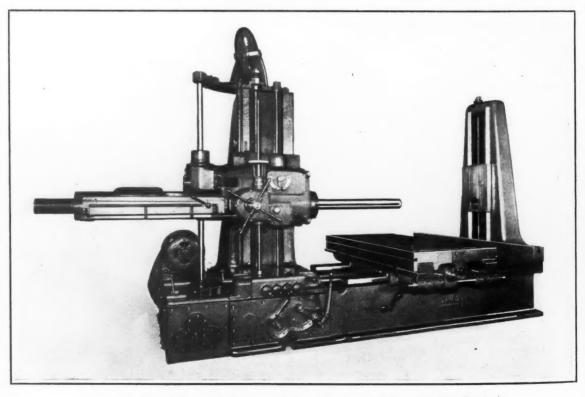
The spindle is fed by means of

a screw and nut, a safety stop and automatic knock-out being provided to prevent jamming. Safety stops are also furnished for the table and saddle. The spindle sleeve is equipped with a simple adjustment for wear.

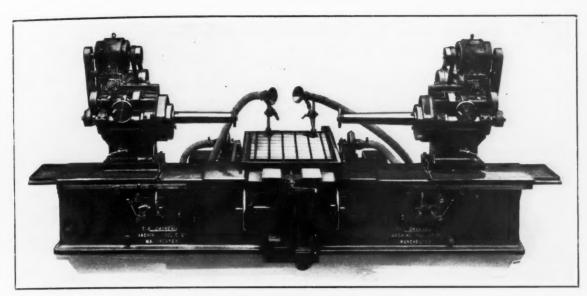
All feeds, speeds, and movements can be reversed instantly through a Twin Disc clutch without stopping the machine. The speed and feed gear-boxes are splash lubricated and the remainder of the machine is lubricated by a centralized force-feed system. Feeds and rapid traverse are applicable to the spindle in and out and up and down, to the saddle along the bed, and to the table across the saddle. They

## GENERAL ELECTRIC COMPOUND PULLEYS

Molded compound pulleys intended for various applications are being placed on the market by the General Electric Co., Schenectady, N. Y. These pulleys are made of Textolite molded around bearings. Four pulley sizes are included in the line; they have outside diameters of  $1\ 1/4$ , 2,  $2\ 1/2$ , and  $3\ 1/2$  inches. Various combinations of pin diameters and bearings can be provided. The 1 1/4-inch pulleys have plain sleeve bearings for 3/16- or 1/4-inch pins, or ball bearings for 3/16-inch pins only; the 2-inch size has plain sleeve bearings for 1/4- or 3/8-



Jones Horizontal Boring Mill Equipped throughout with Ball and Roller Bearings



Churchill Machine Designed for Grinding Both Ends of Air-brake Cylinders without Indexing them

inch pins, or ball bearings for 1/4-inch pins; and the 3 1/2-inch pulleys are made with either plain sleeve bearings or ball

bearings for 1/4- or 3/8-inch pins. The ball bearings are of the single-row, self-contained type equipped with dust shields.

#### CHURCHILL INTERNAL GRINDING MACHINE

A machine with opposed wheelspindles, designed primarily for grinding Westinghouse air-brake cylinders, but which is capable of handling a large range of internal grinding, has been brought out by the Churchill Machine Tool Co., Ltd., Broadheath near Manchester, England. This machine was designed to grind the bore in both ends of the air-brake cylinders without indexing the work.

The two grinding spindles are permanently fixed in the same axis in both horizontal and vertical planes. The work is carried on a table which may be adjusted vertically and transversely; hence pieces of awkward shape or with overhanging portions can be readily positioned in line with the grinding spindles. The two wheel-heads are of a planetaryspindle type, and each is mounted on a separate carriage. These carriages are traversed along the bed by hydraulic means, there being an independent control for each carriage. The piston-rod of the hydraulic mechanism is attached to the under side of the corresponding carriage, and the cylinder is fixed between the bed ways.

Any traversing speed between 0 and 15 feet per minute can be easily obtained by moving a regulating-valve lever. Speed changes can be made while the heads are actually in motion. The maximum stroke of each head is 35 1/2 inches. Any stroke up to the maximum can be accurately obtained by means of trip-dogs mounted on a rack attached to the front edge of the carriages. These dogs operate a reversing lever, which is provided with a withdrawal plunger so that the carriage can be traversed past the position set by the trips without disturbing the setting of the rack. This feature is advantageous in setting up or gaging work.

The amount of eccentricity of the grinding spindles relative to the main spindles is adjustable from dead center to a maximum of 1 1/2 inches. Four mainspindle speeds are obtainable through a gear-box in the head. The grinding wheel spindles are easily detachable from the main spindles, the largest wheel-spindles that the machine is designed to accommodate being able to grind holes up to 35 inches long.

Each grinding head is provided with a five-horsepower constant-speed motor for driving the grinding wheel and producing the planetary motion. A separate three-horsepower motor drives two pumps which develop pressure for the hydraulic mechanism, the dust exhaust fan, and the coolant pump. The net weight of this machine is 21,850 pounds.

## BLISS REDESIGNED SINGLE-CRANK TOGGLE DRAWING PRESSES

The No. 1 1/2 to 3 3/4-B line of single-crank toggle drawing presses built by the E. W. Bliss Co., Brooklyn, N. Y., has been redesigned to include a number of recent developments in press construction. One of the changes has been the discarding of the outboard bar guide for the cross-

head in favor of a gibbed guide on the frame, so as to add strength and rigidity. A further improvement is the substitution of a forked arrangement for the overhung pins of the short link. This change greatly stiffens the blank-holder drive.

In the older press models, the

drive shaft was placed low and close to the frame. While this construction afforded stability, the die-setter found the shaft in his way when setting the rear blank-holder nuts. By raising the drive shaft in the new models, this objection has been overcome and the nuts are readily accessible with the slide in any position.

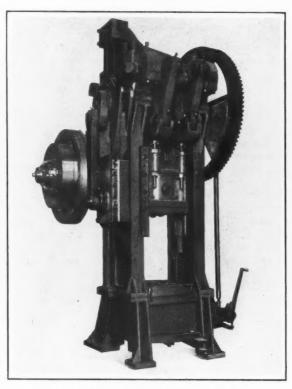
A fully automatic frictionclutch control is now built into the right-hand leg of the machine. This device provides either a hand or a foot control. Three of these disks are used instead of two as in the former type.

The clutch is operated through the usual toggles by a rod that passes through the hollow drive shaft to the right-hand side, where it is connected to the operating shaft and the balanced brake. When the machine is driven from a lineshaft, the belt may run on the clutch rim. Either this rim or that of the flywheel may be used for motor drives. The drive is more compact than previously, which results in a saving in right to left space of 22 inches for the No. 1 1/2 press and 31 inches for the No. 3 1/2-B press.

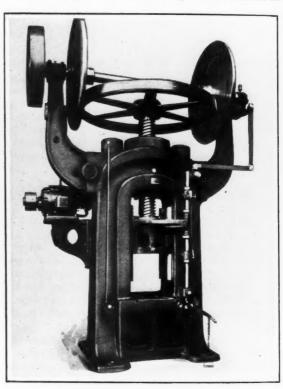
#### SCHATZ FRICTION SPINDLE PRESSES

Friction spindle or percussion presses are being introduced to the trade by the Schatz Mfg.

The machine illustrated has a rated capacity of 500 tons pressure. Other specifications are as



Bliss Single-crank Toggle Drawing Press Recently Redesigned



Friction Spindle or Percussion Press Made by the Schatz Mfg. Co.

In using the foot control, the handle is stationary, but it may be used to stop the press instantly on the way down should the operator see, after pressing the treadle, that the work has been wrongly placed in the die.

The drive shaft runs in Timken bearings and carries a combined clutch and flywheel of new design. The flywheel, which runs freely on the shaft when the press is idle, is also mounted in a pair of Timken bearings and is equipped with a friction clutch having driving disks of steel with interwoven asbestos facing. Co., Poughkeepsie, N. Y., in sizes of from 25 to 1400 tons pressure and in open-end, double-housing, and four-pillar designs. One of these presses is shown in the illustration. Machines of this type have no dead center and deliver a powerful cumulative end blow. They may be used for the hotand cold-pressing of ferrous and non-ferrous materials, stamping, coining, embossing, and bending. For work requiring less pressure than the capacity of the machine, the stroke is shortened and the pressure reduced, thereby lengthening the life of the dies.

follows: Stroke, 18 inches; distance between bed and ram with ram down, 15 inches; size of bed, 22 by 31 1/2 inches; dimensions of ram surface, 16 1/2 by 23 inches; and speed of operation, 12 strokes per minute. This machine requires a 25-horsepower motor and was especially designed for embossing silverware, cutlery, instruments, etc. Forging presses have a longer stroke and a higher die space.

While the control mechanism ordinarily provided operates easily, an air control can be furnished. Automatic knock-outs

can also be supplied. The machine can be driven either by means of tight or loose pulleys from a

lineshaft or by an individual belted motor drive as shown in the illustration.

#### GLOBE DYNAMIC BALANCING MACHINE

Speed and accuracy are the principal advantages claimed for a dynamic balancing machine being introduced on the market by the Globe Tool & Engineering Co., Dayton, Ohio. It is said that the amount and location of unbalance in a part can be de-

reversible electric motor which can be plugged into any light socket. First one saddle and then the other is unlocked after setting amplitude indicators and a locator stylus to zero.

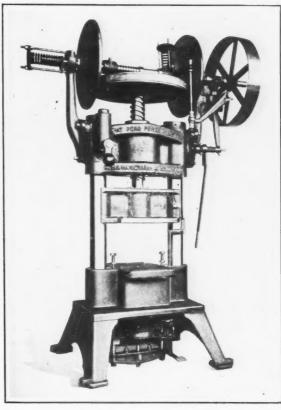
The locator stylus marks the shaft to show the exact point

where weight must be added to correct the unbalance. The mass of unbalance is read directly on the indicators. The operator then reads, from a chart which has been prepared, the weight to be added or removed at the point on the work indicated by the machine.

This machine is built in two sizes, one of which is for armatures from 2 to 7 inches in diameter, and the other for work 2 inches and less in diameter.



Globe Dynamic Balancing Machine



Zeh & Hahnemann Percussion Press

#### termined within thirty seconds and that the equipment is unusually sensitive. The machine is designed with a brake that speeds up the readings. The brake is used to hold the part being balanced while weights are added in the machine, if neces-

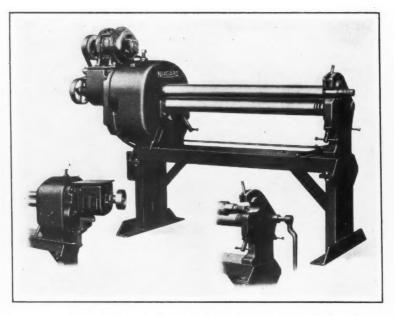
For an operation, special ball bearings with bushings to fit the shaft of the work are slipped on the work, and this assembly is then placed in the machine saddles. The saddles are next locked and the work is rotated through an auxiliary driving means by a

#### ZEH & HAHNEMANN PILLAR-TYPE PERCUSSION PRESS

A percussion press of the pillar type recently constructed by the Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark, N. J., is shown in the accompanying illustration. This press is rated as yielding a pressure of 100 tons, but in actual tests a pressure of 150 tons has been developed. The distance between the uprights is 30 inches. The press makes 25 strokes per minute, requires a five-horsepower motor, and weighs 7500 pounds.

Two other sizes, of 50 and 75 tons capacity, respectively, are also available.

In addition to forming light metal work of large area, these presses are suitable for many other purposes; for instance, they are used in the manufacture of grinding wheels and in prepressing Bakelite and similar materials. A patented pneumatic ejector removes the finished product quickly from the mold and this insures a high output.



Niagara Slip-roll Former with 4-inch Diameter Roll

#### NIAGARA SLIP-ROLL FORMER

A slip-roll former with a 4-inch diameter roll has been added to the line of equipment built by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. This equipment is intended for forming sheet metal into cylindrical shapes, and is adapted for the manufacture of such products as steel drums, metal furniture, and aircraft parts.

The operator works entirely at the handle end of the machine, thereby reducing the time required for each job. The top roll is pivoted at the left-hand end and is merely swung forward for sliding the work off. This roll is locked in the operating position by a quick releasing mechanism that is controlled by a small knurled handle or trigger. Adjustment of the lower front and rear rolls is accomplished through vise-handle screws without the use of wrenches.

Three lengths of rolls, 36, 48, and 60 inches, respectively, are available. They can be furnished for hand operation or with a pulley or belted-motor drive. A compact, self-contained and enclosed unit can be applied readily to the Nos. 349, 351, and 353 hand-operated forming rolls to operate them by power, a two-horsepower motor being re-

quired. A reverse clutch built into the power unit permits of running the rolls forward or backward.

#### NAZEL MOTOR-DRIVEN HAMMERS

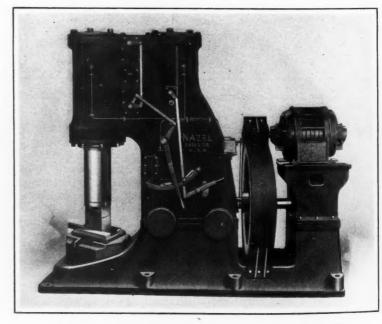
Single and set blows are obtainable with precision, in addition to variable automatic blows,

in the line of self-contained motor-driven air hammers recently brought out by the Nazel Engineering & Machine Works, Philadelphia, Pa. These Type S hammers were developed to meet the demand for larger motor-driven hammers that would handle all kinds of general forging.

The illustration shows the No. 14 size, which has the following specifications: Size of work handled, 13 inches square; number of blows struck per minute, 100; rating of motor, 75 horsepower; stroke of ram, 32 1/4 inches; distance between dies (clear working space), 32 1/4 inches; distance from center of ram to housing, 29 1/2 inches; weight of hammer without anvil, 46,000 pounds; weight of anvil, bolster, and die, 26,000 pounds, and total weight, 72,000 pounds.

#### DIENELT & EISENHARDT SHEET METAL FORMING MACHINE

Sheet metal of No. 10 gage, up to 36 inches in width, can be formed into window framing, cornice molding, door butts, and the like on a roll type of machine built by Dienelt & Eisenhardt, Inc., 1304-18 N. Howard St., Philadelphia, Pa., for the J. S. Thorne Co. of the same city.

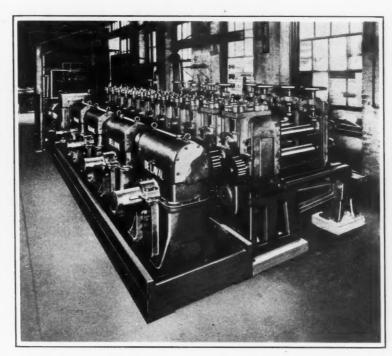


Nazel Motor-driven Hammer which Gives Single and Set Blows, as well as Variable Automatic Blows

This equipment, as shown in the illustration, consists of twelve pairs of horizontal rolls between which the strips of metal pass. The rolls are so shaped that the metal is formed progressively into its final shape, the impressions becoming sharper and deeper as the material passes through the machine. The metal can be formed to sharp angles without breaking at the bends. The speed of the sheet metal is about 65 feet per minute.

To prevent wide and heavy material from rising and buckling between the rolls, the forming rolls are set at horizontal center distances of only 16 inches. In handling heavy-gage material narrower than 36 inches, it is desirable that the roll bearings be moved inward to reduce roll deflection. This has been provided for by making the bearing housings or supports movable on the baseplate, and by bushing the rolls so that the bearing points can be in any location desired. The vertical clearance between the rolls is adjustable.

The rolls are connected by spur gears in four groups of three, each group being driven through worm reduction gearing. The worm-spindles are coupled together to form a continuous longitudinal lineshaft.



Roll-type Forming Machine which Handles Sheets of No. 10 Gage up to 36 Inches in Width

The motor shaft, which runs at 860 revolutions per minute, drives the line of worm-spindles through helical reduction gearing. Each worm-wheel shaft is

extended on both sides of the machine to provide for the installation of a duplicate row of rolls on the opposite side of the worm-gears.

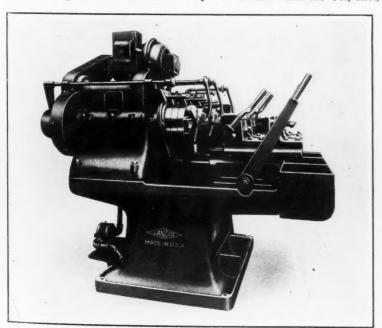
### LANDIS BOLT-FACTORY THREADER

The bolt-factory threader built by the Landis Machine Co., Inc.,

Waynesboro, Pa., has recently been redesigned as illustrated, to include a constant-speed motor drive and a pick-off gear-box. By using a gear-box of the pick-off type, it is possible to obtain the most efficient threading speed for any particular job. Fifteen threading speeds ranging from 38 to 271 revolutions per minute are available through eight sets of interchangeable gears. Other speeds can be obtained by the substitution of different gears.

All the shafts in the new gearbox are made of alloy steel and are mounted in anti-friction bearings. All the bearings are lubricated by the Alemite system. The constant-speed motor is directconnected to the gear-box through a silent chain.

A low-speed, low-pressure, large-volume pump, belt driven from a constant-speed shaft, floods the chasers and work with coolant. The coolant system has been redesigned to provide a



Landis Bolt Threader with Constant-speed Motor Drive and Pick-off Gear-box

larger volume of coolant at all cutting speeds. This machine is made in 1- and 1 1/2-inch triplespindle models.

## THERMOSTAT CONTROL FOR MELTING POTS

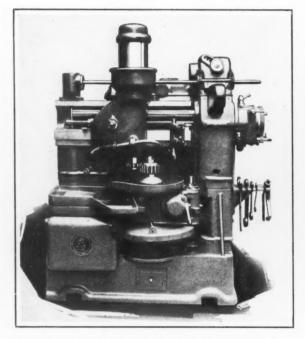
A quartz-rod thermostat for controlling the temperature of pots employed for melting lead, tin, babbitt, solder, and similar metals, has been brought out by the General Electric Co., Schenectady, N. Y. This thermostat has a temperature range of from 450 to 950 degrees F., and will control temperatures to within plus or minus 14 degrees F. of its setting. The contacts are designed to carry any current necessary to operate any standard automatic control panel.

rather than under compression, and is practically twice as long as the one used on the 5-inch stroke machine; consequently the life of the spring should be materially increased.

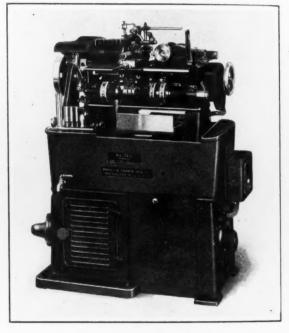
A feature of the drive is the fact that the cutter-spindle is provided with a cylindrical rack. Meshing with this rack is an "enveloping" pinion provided with two integral keys which prevent shearing of the keys. The machine will cut external or internal gears up to 18 inches pitch diameter and 4 diametral pitch, the capacity being the same as on the regular machine.

#### FELLOWS GEAR SHAPER WITH THREE-INCH STROKE

By limiting the cutting stroke of the 6A-type gear shaper manufactured by the Fellows Gear counterbalance spring is completely enclosed in the spindle. This spring works under tension



Fellows Gear Shaper with Reduced Stroke which Increases the Productive Capacity



Brown & Sharpe High-speed Motor-driven Automatic Screw Machine

Shaper Co., 78 River St., Spring-field, Vt., to 3 inches instead of 5 inches, it has been possible to eliminate the customary cutter-slide and use a one-piece cutter-spindle somewhat similar in design to that used in the high-speed gear shaper built by this concern. This change in design has increased the productive capacity of the machine because it makes possible the use of coarser feeds and higher reciprocating speeds.

The cutter-spindle is a onepiece forging with the guide attached. It is made hollow so as to reduce the weight, and the

## BROWN & SHARPE HIGH-SPEED AUTOMATIC SCREW MACHINE

The range of spindle speeds available on the No. OOG automatic high-speed motor-driven screw machine built by the Brown & Sharpe Mfg. Co., Providence, R. I., has been increased. Thirty spindle speeds ranging from 243 to 5000 revolutions per minute are now available. This broad range adapts the machine for producing parts from steel as well as from brass, aluminum, and other free cutting metals.

The different speeds are obtained by means of ten change-

gears and three spindle driving pulleys. A high speed can be used for forming and similar operations and this can be conveniently changed to a low speed for threading. The machine can be equipped with various stock attachments, such as an automatic rod magazine and a vertical slide.

No changes have been made in the construction of this machine other than those required to give increased range of spindle speeds.

## SCHATZ BRAKE, ROUNDING AND BOX-FORMING MACHINES

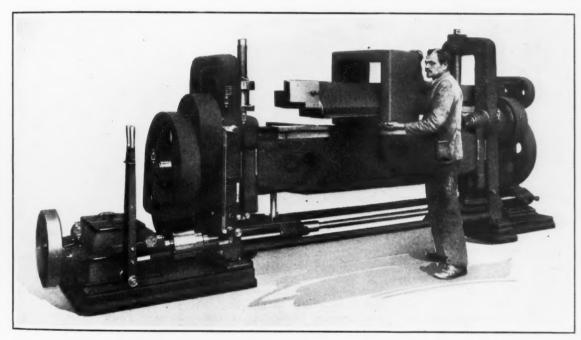
Metal sheets and plates up to 5/8 inch thick can be bent or rounded in universal brake, rounding and box-forming machines being placed on the market by the Schatz Mfg. Co., Poughkeepsie, N. Y. These machines are built in widths of from 40 inches to 16 feet. They are available with or without a swing-out top bar which enables closed forms bent around the bar to be removed. The illustration shows a machine with the top bar swung out to permit the

which saves time and labor in changing them.

These machines are built for either hand or power operation. On the power-driven machines there is an adjustment for returning the folding bar or bending leaf to any point in its stroke, the upward and downward motion being effected at one engagement of the machine. The top and bottom bars are also adjustable by power. A special safety device prevents the top bar from being clamped down too tight and damaging the material.

#### NATIONAL-CLEVELAND UNIVERSAL GEAR SHAPER

Spur and spiral gears can be cut with the same cutter in the universal gear shaper recently brought out by the National Tool pitch and pressure angle of a spur gear equals that of the cutter, while the normal diametral pitch and pressure angle of a



Schatz Folding Brake which Handles Metal Sheets and Plates up to 5/8 Inch Thick

removal of a closed box made from one sheet of material. Boxes with inside or outside flanges can be produced quickly.

The high lift of the top bar, the low drop of the bottom bar (both by power), and the far outward adjustment of the folding bar are important features of these machines. Special rectangular mandrels for sharp bends and round mandrels or rounding blades for radius bends can be inserted between the bars. Bulky work and work with high flanges can be accommodated. There is a patented system of attaching the blades

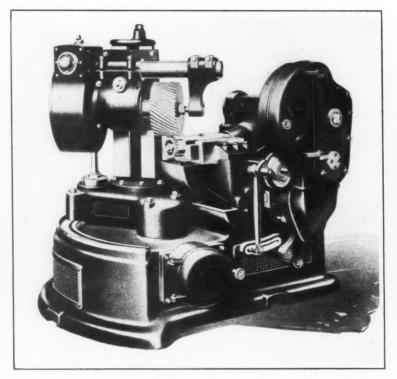
Co., Madison Ave. at W. 112th St., Cleveland, Ohio. Either right-or left-hand spiral gears having a helical angle up to 45 degrees may be cut with the standard equipment. By the use of a special work-slide, spiral gears of either hand, with helical angles greater than 45 degrees, can be cut. This includes single- or multiple-thread worms of the hour-glass form which have high helical angles.

The machine employs a straight-tooth gear-shaper cutter. The normal pitch of the gear produced equals the pitch of the cutter. The diametral

helical gear also equal those of the cutter, regardless of the helical angle.

The work-holding head may be adjusted quickly and accurately to the desired angle for cutting helical gears and into the zero position for cutting spur gears. To facilitate these settings, there is a vernier scale reading to 5 minutes, used in conjunction with a scale graduated in degrees.

This universal gear shaper has a double generating action. One of these actions may be likened to the rolling of a gear in contact with a plastic blank to generate teeth in the blank as the



National-Cleveland Gear Shaper which Cuts Spur and Spiral Gears with One Cutter

gear is forced into the plastic material, the blank and gear rotating together in the same manner as two meshing gears. The other generating action is similar to that which would result if a rack having teeth were forced into a plastic blank rotated in timed relation with the transverse movement of the rack across the blank face. The rack teeth would generate teeth in

the plastic blank.

This double generating action results in progressively cutting away the metal to form the teeth throughout the entire circumference of the gear and, in the case of spur gears, throughout the entire length. In the case of helical gears, the teeth are also cut progressively throughout the entire circumference, and the cut gradually moves across the face of the gear as tangency is reached between the desired pitch cylinder of the gear and the pitch circle of the cutter.

Several important advantages are claimed for this double generating action. First, the gear and cutter may be rotated at high speeds. Second, the rapid rotation of the cutter and gear blank and the relatively slow feeding movement of the cutter transversely across the face of

the blank produces fine chips. These chips are largest when the cutting action begins and finest toward the end of the double generating action. In this way. the heat generated in the work and the greater stresses placed upon the machine by the heavier cuts are practically dissipated when the finer chips are produced in the actual finishing of the teeth. The amount of feed is under the control of the operator and the feed movement takes place just before the cutting stroke

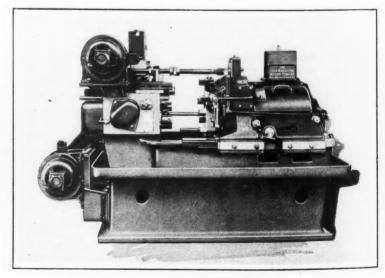
Owing to the fact that all the teeth are cut progressively throughout the entire circumference and length, it is impossible to determine from the appearance of a finished gear where the cutter first began to cut and where it ceased.

This universal gear shaper is built in four sizes which have capacities for spur and spiral gears up to the following sizes: 12 inches in diameter by 6 inches face width; 18 inches in diameter by 9 inches face width; 36 inches in diameter by 12 inches face width; and 72 inches in diameter by 15 inches face

#### GOSS & DE LEEUW CHUCKING MACHINE

A model of intermediate size has been added to the line of tool-revolving automatic chuck-

ing machines built by the Goss & DeLeeuw Machine Co., New Britain, Conn. This new 8 1/2-



Goss & DeLeeuw Chucking Machine of Intermediate Size

by 8-inch model is identical in design to the 6- by 6 3/4-inch and 11- by 10-inch models, but is midway between the two in size and capacity. The four spindles have a center-to-center distance of 8 1/2 inches, and the total feed stroke obtainable is 8 inches. Goss & DeLeeuw patented 12-inch two-jaw chucks are standard equipment. The machine weighs 12,000 pounds.

The threading spindle of the new machine is controlled by a lead-screw that is in constant engagement, the same as the other two machines of the line. This screw is driven by an independent reversing electric motor and thus clutches are eliminated. The machine can index up to 480 times per hour. It is particularly adapted for service in the plumbing-supply field, the automotive industry,

#### CARBORUNDUM WHEELS AND MOUNTED POINTS FOR DIE GRINDING

There are several types of small portable grinders on the market that are being used principally for die grinding, as well as for finishing metal patterns, and for finish-grinding castings, particularly ornamental pieces made in brass, bronze, and aluminum foundries. These machines are usually designated as either flexible-shaft type machines or machines directly driven by air or electricity.

Practically every shop doing die work is equipped with one or more of these portable grinders, and owing to their wide application, the Carborundum Co., Niagara Falls, N. Y., has standardized on special shapes and sizes of wheels for these grinders. These wheels and mounted shapes, as shown in the accom-

panying illustration, have been developed in cooperation with several of the machine manufacturers with a view to meeting the demands of users for practically any class

of work for which these machines are adapted.

Wheels are available for different kinds of materials such as steel, cast iron, aluminum, and bronze alloys, and also for different requirements such, for example, as where a fast cut is required, or where a slow speed is used because it is essential that the abrasive point hold its shape.

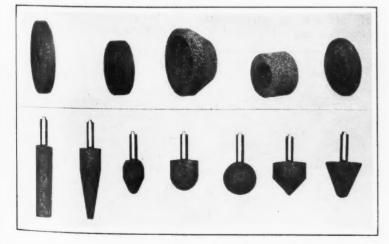


Gallmeyer & Livingston Surface Grinder with Hydraulic Feed

Should the operator using the special shapes available desire to change or modify the design of any of these shapes, the use of a small Carborundum Brand dresser stick is recommended for forming such shapes as are needed to suit any particular job.

#### GALLMEYER & LIVINGS-TON SURFACE GRINDER WITH HYDRAULIC FEED

A smaller size has been added to the line of surface grinders built by the Gallmeyer & Livingston Co., 344 Straight Ave., S.W., Grand Rapids, Mich. The new machine, known as the No. 2, is equipped with a hydraulic feed for the longitudinal movement of the table and for the cross-feed. The working surface of the table is 6 by 18 inches. By simply moving the control lever on the front of the base at the upper right-hand corner, an infinite speed variation can be obtained from 0 up to 60 feet or more per minute. The crossfeeds range from 0.010 to 0.125 inch, and the feed can be made



Carborundum Wheels and Mounted Points for Grinding Dies and Finishing Metal Patterns and Castings

to operate at either end or at both ends of the stroke.

When the automatic hydraulic feed is in operation, the mechanism for hand operation of the table is disengaged; and when the machine is to be operated by hand, the piston-rod connection to the table is disengaged. The base houses the motor, the hydraulic pump with its control valve, and the tank that holds the oil for the hydraulic operation.

The head ways are protected from dust and dirt to reduce the tendency to stick. The elevating screw is located centrally between the ways to eliminate any cramping action sidewise, and the weight of the head unit has been so proportioned as to obviate any cramping action from front to back.

The illustration shows the machine arranged for wet grinding, but with the front and rear table splash guards removed. The ma-

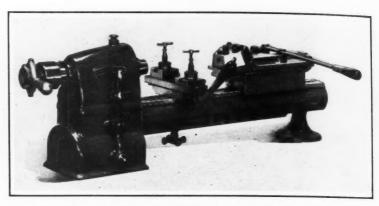


Fig. 2. "Cataract" Hand Screw Machine with the Same Headstock as the Bench Lathe

chine can also be furnished for dry grinding and with a dustcollecting system. The standard wheel size is 8 inches diameter by 1/2 inch face width, but variations from standard are feasible. Work up to 9 1/2 inches thick can be ground under the standard 8-inch wheel.

DRIVEN BENCH LATHE AND

#### "CATARACT" MOTOR-DRIVEN BENCH LATHE AND HAND SCREW MACHINE

"Cataract" motor-driven bench lathes and hand screw machines manufactured by Hardinge Bros., Inc., 4147-49 Ravenswood Ave., Chicago, Ill., are now provided with a completely enclosed headstock and are driven by V-belts throughout. The drive from the reversing unit to the headstock spindle is through three V-belts. The spindle construction is the same as on the cone-driven machines and the collets are also the same as the ones previously used. Fig. 1 shows the bench lathe, and Fig. 2 the hand screw

machine. These machines are built in a complete range of five sizes, having collet capacities from 1/2 to 1 inch, and swings of 7 and 9 inches.

Six spindle speeds ranging from 140 to 1600 revolutions per minute are available through high- and low-speed pulleys of a transmission intended to be mounted beneath the bench on which the machine is installed, and three-step cone pulleys on the motor and driving shafts. High and low speeds are controlled by means of a clutch at

the front of the bench, while reverse rotation is controlled through a gear-box shifted by a "Pullmore" clutch which is operated by a handle at the front of the headstock.

The transmission is equipped with self-aligning grease-packed ball bearings throughout. It is connected to the bench by means of rubber mountings which deaden vibration. To expedite the changing of belts on the cone pulleys, the motor is mounted on an adjusting plate which relieves the tension on the belts while they are being shifted.

The reversing unit is independent of the transmission, so that the machines can be supplied with or without it. The reversing unit runs in one direction at all times. Reversal is instantaneous, thus meeting the needs of light production tapping and similar operations.

#### AXELSON IMPROVED HEAVY-DUTY LATHES

Several improvements have recently been made in the lathes built by the Axelson Mfg. Co., Ltd., P.O. Box 337, Los Angeles, Calif., particularly in the heavyduty twelve-speed machine which is shown in the illustration. This lathe was developed primarily for shops turning oil-well drilling bits and oil-well reamers or machining large work. Three levers at the front of the headstock afford a quick selection of the spindle speeds. Starting, stopping, and reversing control levers are located close to each other to permit fast and safe

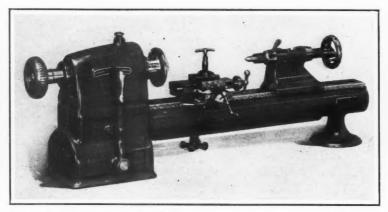
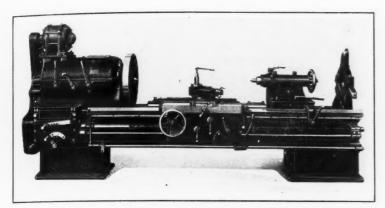


Fig. 1. "Cataract" Lathe with Enclosed Headstock and V-belt Drive



Axelson Heavy-duty Twelve-speed Lathe

operation. One control lever is located at the headstock, while the other travels with the carriage. A quick-change gear-box provides forty-five feeds by the manipulation of two levers. All feed changes can be made while the lathe is in operation.

#### OSTER-WILLIAMS GASOLINE-DRIVEN THREADER

The No. 412 "Power Boy" pipe threader and cutter made by the Oster Mfg. Co. and the Williams Tool Corporation, Cleveland, Ohio, is now available with a gasoline-engine drive. The engine is of 1 horsepower rating, of a single-cylinder type, and is air-cooled. It will operate for about ten hours on a single gallon of gasoline. The engine is connected to the equipment by a roller chain.

#### BOWEN POSITIVE LUBRICATION SYSTEM

The Bowen Products Corporation, Auburn, N. Y., has recently produced a Type B lubrication system for application to all kinds of machinery. This system comprises an oil reservoir, hand-operated pump, and oil measuring devices, which are assembled at the points lubricated or in a manifold. The various units of the system are connected by tubing to one another and to the points lubricated, as shown diagrammatically in the illustration.

A single operation of the pump lever forces oil under pressure through the tubing of the distribution system to the oil measuring devices. These devices accurately measure and deliver predetermined amounts of lubricant under high pressure to the individual points to be lubricated. Any grade of oil, from light machine oils to the heaviest oils that can be pumped, can be handled wthout adjustments. Large or small reservoirs and pumps and various assemblies or combinations of the measuring devices are available.

For a single lubrication, the pump lever is operated once only, being depressed until it stops solidly against oil in a tube, after which the lever is returned to its upper position. If more oil is required, this operation is repeated after a few seconds. In normal operation, the pump delivers oil under a pressure of about 500 pounds per square inch.

The volume of oil delivered by any measuring device or control is independent of the distance from the pump to the control, the temperature of the particular control, as compared with any other, or the fit of the bearing, provided that the line pressure is great enough. The controls normally supplied are the No. 1, which has a 1/16-inch stroke and delivers approximately three drops of oil; the No. 3, which has a 3/16-inch stroke and delivers eleven drops of oil; and the No. 6, which has a 3/8-inch stroke and delivers twenty-two drops of oil. Controls for intermediate and smaller volumes of oil can also be supplied.

#### LUFKIN DIRECT-INDICATING MICROMETER

The Lufkin Rule Co., Saginaw, Mich., has developed a method of marking micrometers that gives the total reading of measurements without the necessity of making additions. As will be seen from the illustration, the hub markings are the same as on the regular type of micrometer, the 0.100-inch graduations being long lines marked by figures from 0 to 9. The three shorter lines between these graduations indicate divisions of 0.025, 0.050. and 0.075 inch. The sleeve is notched or cut away at the zero point, so that with each revolution of the spindle a new graduation line comes instantly into

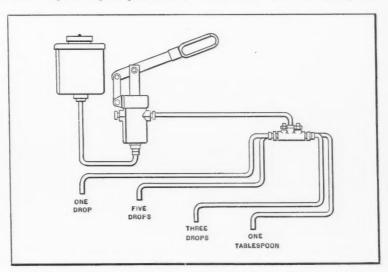
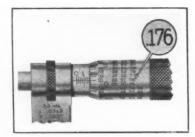


Diagram of the Bowen Type B Lubrication System



Markings of the Lufkin Directindicating Micrometer

view when the zero point on the sleeve is reached.

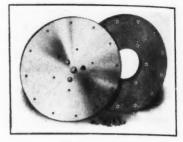
On the sleeve, along the edge, there is a row of figures from 0 to 24. There are also three rows of figures toward the right which indicate 25 to 49, 50 to 74, and 75 to 99, respectively. These rows are arranged in spiral form, so that they follow each other without interference.

In reading this micrometer, the last line in view on the hub is noted. If it is a long line, the number in the column along the edge of the device is observed; if it is the first short line after a long line, the figure in the first of the right-hand rows is read; if it is the second short line after a long line, the figure in the second right-hand row is determined; and if it is the third short line after a long graduation, the figure in the third righthand row is noted. If the reading is taken from any of the right-hand rows, the figure along the edge of the sleeve that is opposite the line on the hub is prefixed to the number obtained from the right-hand row. Thus, the setting of the micrometer in the illustration is 0.176 inch.

#### LITTELL PUNCH PRESS FEEDS

Flat-sided clinch-nuts are fed rapidly into the dies of punch presses by means of a feed developed by the F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill., which embodies a patented turn-over. This device is simple in construction, as may be seen in Fig. 1. As the nuts slide from a hopper down through a curved slot, they are straightened by the turn-over and enter the punch press dies in the right position. Thus they can be quickly set in automobile body parts and similar work.

Another recent development of the same concern is the double roll feed shown in Fig. 2. This feed is especially designed for handling light strip stock. The stock handled by the particular feed illustrated is a soft aluminum shape such as is used for beading on automobiles. The feed rolls are equipped with sleeves grooved to suit the stock shape. These sleeves are interchangeable so that several shapes can be handled with one feed mechanism. By driving the feed from the rear, the changing of sleeves is facilitated.



Grinding Disk and Steel Plate to which it is Held by Cap-screws

#### "RED ANCHOR" GRINDING DISKS

Grinding disks in which the abrasive member is held to the steel backing plate by cap-screws which enter nuts anchored in the abrasive members are being placed on the market by the Covel-Hanchett Co., Big Rapids, Mich. The construction of these "Red Anchor" disks is apparent from the illustration. The nuts are molded into one side of the grinding disk during its manufacture, and are spaced to match drilled holes in the steel plate. As the disk becomes worn, it can be readily replaced. Steel backing plates now in use can be drilled to permit the application of these grinding disks.

Grinding disks bonded by the silicate, vitrified, or Bakelite processes are available, with either silicon of carbide or aluminous grains. They are intended to be used for either wet or dry grinding.

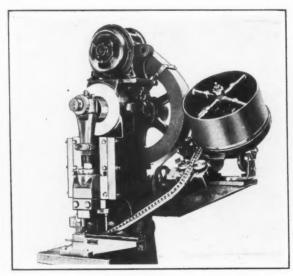


Fig. 1. Punch Press Equipped with Littell Clinch-nut Feed

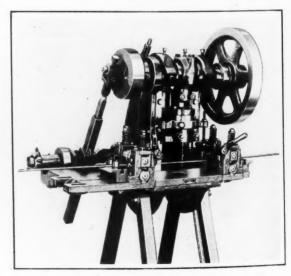
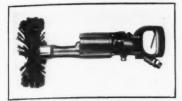


Fig. 2. Double Roll Feed for Handling Light Shaped Strip Stock



"Hercules" Wire Brush and Grinder

#### "HERCULES" WIRE BRUSH AND GRINDER

A wire brush and grinder recently added to the line of "Hercules" air tools manufactured by the Buckeye Portable Tool Co., Dayton, Ohio, is shown in the accompanying illustration. This tool was especially designed for heavy-duty grinding, wirebrushing, snagging, and buffing. It can be furnished for operation at speeds of 2000, 3100, and 4000 revolutions per minute. The weight is 13 pounds.

#### HAMMOND HEAVY-DUTY GRINDERS

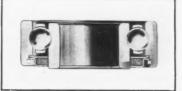
A grinder intended for continuous production service in heavy tool grinding has recently been added to the line of equipment manufactured by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. This Type W grinder is made in 5- and 7 1/2-horsepower capacities. As in all the grinders built by this com-

pany, these machines are driven by totally enclosed, 40-degree centigrade motors, fitted with air cleaners which supply clean, cool air to the motor windings and eliminate grit and dirt.

The machines are equipped with a push-button control and a Cutler-Hammer automatic motor starter having thermal-overload, low-voltage, and phase-failure protection. The starter is mounted on the inside of the pedestal door for convenience in resetting and inspecting. The wheel guards are made of boiler plate steel and have hinged doors to permit quick removal of the grinding wheels. They are equipped with spark shields and shatterlessglass eye shields. Adjustments are provided to compensate for wheel wear.

#### SKF FELT-SEAL BALL BEARING

In a patented ball bearing recently developed by the SKF Industries, Inc., 40 E. 34th St., New York City, a felt seal is furnished as an integral part of the bearing, thus making it necessary for the machine manufacturer to provide only one housing enclosure. The bore and outside diameter are ground to international standard dimensions and tolerances. The width is made slightly greater than the standard dimension of a single-row



Construction of SKF Felt-seal Ball Bearing

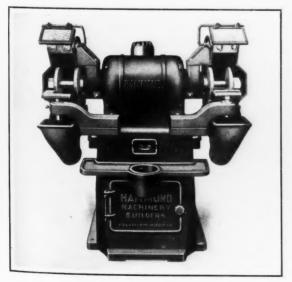
ball bearing in order to accommodate the felt seal.

The inner race projects a little beyond the face of the seal so that the bearing may be pulled off the shaft at any time without damaging the seal plates. As illustrated, the seal consists of an inner steel plate, which is dished around its periphery and bears against a shoulder on the outer race. A removable felt of substantial size comes next, then a dished steel end plate, and, finally, a split steel ring which is fitted into a groove in the outer race to hold the assembly in place.

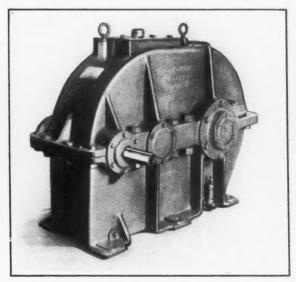
A feature of the construction is the ease with which the seal may be disassembled at any time for replacing the felt.

#### WESTINGHOUSE-NUTTALL SPEED REDUCERS

Single- and double-reduction speed units of the design illustrated are being introduced on the market by the Westinghouse



Hammond Grinder Designed for Continuous Production Service in Heavy Tool Grinding



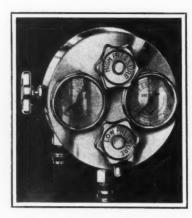
Westinghouse-Nuttall Speed Reducer Made in Single- and Double-reduction Types

Electric & Mfg. Co., East Pittsburgh, Pa., for general industrial service. These Type SH and DH speed reducers are of the non-planetary design, with the shafts arranged in a horizontal plane, and they are available with either a right- or a left-hand assembly. Both types are made in twelve sizes and provide a total of twenty-eight standard reduction ratios ranging from 2.82 to 1 up to 70.5 to 1. Capacities range from 1 to 635 horsepower.

Single helical gearing has been adopted as standard for these units. A long and short addendum tooth form with full-depth teeth is used to obtain maximum strength and tooth overlap. There is a single Timken bearing at each end of all high-speed and intermediate shafts. On lowspeed shafts, a Hyatt bearing is used at the extension end and a double Timken bearing at the closed end. Thorough lubrication of the gearing and bearings is insured by a simple positive splash system.

#### OXY-ACETYLENE GAS REGULATOR

A two-stage regulator which permits the use of oxy-acetylene gas from one set of tanks for simultaneously welding and cutting has been designed by the Bastian-Blessing Co., 241 E. Ontario St., Chicago, Ill. One of the principal advantages claimed for this device is that the correct flame for welding or



Two-stage Oxy-acetylene Gas Regulator

cutting is constantly maintained, despite any fluctuations in the pressure in the tanks. Another advantage is that practically all gas in both tanks may be used up. Compactness, adjustability, light weight, accessibility, and simplicity are other features.

#### BROWN & SHARPE FILLET AND RADIUS GAGES

Gages designed to permit rapid checking of fillets and radii are being introduced on the market by the Brown & Sharpe Mfg. Co., Providence, R. I. Concave and convex radii of the same size are included on the same blade. This double-end feature reduces by one-half the number of blades necessary for a given range.

The blades are long and can be easily applied to places ordinarily hard to reach. They are slotted, and slide easily, the slot feature making many gages available at one time. A clamp nut is used to lock the blades in any desired position.

Two styles of gages are made. The Nos. 627A and 627B are of the design shown in Fig. 1. They have a blade form which is particularly adapted for checking fillets and radii in corners or against shoulders. The No. 627A gage has a range of from 1/32 to 17/64 inch, in sixtyfourths of an inch, and the No. 627B, from 9/32 to 33/64 inch, in sixty-fourths of an inch. The Nos. 627C and 627D gages are of the construction illustrated in Fig. 2, and are especially useful in laying out forming tools and similar work. The No. 627C has a range of 1/32 to 1/4 inch, in sixty-fourths of an inch, and the No. 627D, 17/64 to 1/2 inch, in sixty-fourths of an inch.

#### RADIUS DRESSER FOR GRINDING WHEELS

A device designed for dressing surface grinding wheels either concave or convex for grinding sectional dies, punches, models, tools, etc., to various radii has been produced by the Universal Tool & Machine Co., 14 St. Louis Ave., Dayton, Ohio. This device was designed by A. A. Anglemyer. Accurate blocks are used for setting the diamond of this equipment in the proper position for grinding to any radius.

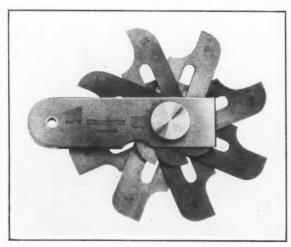


Fig. 1. Brown & Sharpe Radius and Fillet Gage with Eight Blades

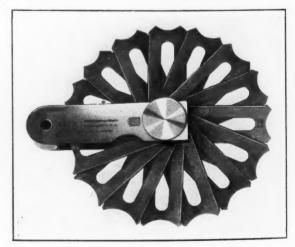
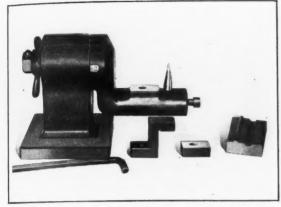
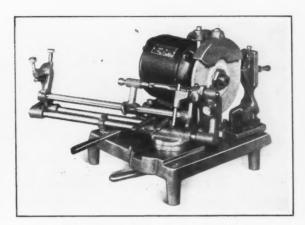


Fig. 2. Brown & Sharpe Radius and Fillet Gage with Sixteen Blades



Equipment for Dressing Grinding Wheels Concave or Convex



Motor-driven Tap Sharpening Machine Made by Wells Mfg. Co.

From the illustration it will be seen that there is a Z-shaped set-up block which is mounted on the swivel-arm that holds the diamond. When the diamond is brought into contact with the accurate under surface near the top of this block, the diamond point will coincide with the axis around which the swivel-arm pivots. If the swivel-arm were swung back and forth with the diamond in this setting, the diamond would rock about a point and would not dress the wheel.

In setting the diamond for dressing a wheel convex to any radius up to 0.750 inch, a gage block or blocks would be placed between the Z-block and the diamond to set the diamond below the swivel-arm axis an amount equal to the desired radius. If the swivel-arm were then swung back and forth, the diamond point would move in a circular path for dressing wheels convex.

For dressing a wheel concave, the 0.500-inch set-up block is mounted between the base of the Z-shaped set-up block and the finished flat surface of the swivel-arm. By then bringing the diamond in contact with the finished surface of the Zshaped set-up block, the diamond will be raised 0.500 inch above the axis of the pivot arm and will swing in a path of that radius. Any radius of less than 0.500 inch can be obtained by inserting between the Z-shaped set-up block and the diamond a combination of gage-blocks that equals the difference between 0.500 inch and the radius to which the wheel is to be dressed. Larger radii may be obtained by using a set-up block greater than 0.500 inch in thickness in combination with the Z-shaped set-up block. After the diamond has been set to the right radius, the set-up blocks are removed.

At the extreme right of the illustration there is an example of work produced by grinding wheels dressed with this device. Zero and 90-degree marks are placed on opposite sides of the swivel-arm so that the operator knows readily when the diamond has been swung through 180 degrees. As this dresser pivots in a horizontal plane, the grinding wheel can be fed down to the diamond conveniently. Wheels can be dressed without removing the guards. Both sides of the base are machined parallel with the shaft of the swivel-arm so as to permit convenient set-ups on magnetic chucks by the use of straightedges.



Limit Snap Gage with Adjustable Gaging Plugs

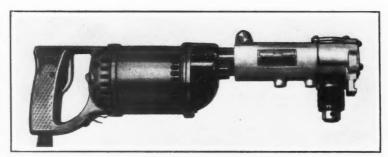
#### WELLS TAP SHARPENERS

Two small motor-driven outfits for sharpening taps are being introduced on the market by the Wells Mfg. Co., P. O. Box 613. Greenfield, Mass. The illustration shows the No. 12 machine, which is designed for grinding taps eccentrically. It is claimed that, with this method, each tooth is given a new edge having a correct curve on all lands, which eliminates the possibility of any one land taking all the cutting strain and thus being ruined by dulling excessively. The machine is driven by a 1/6-horsepower motor, on the shaft of which the emery wheel is mounted. The outfit occupies a bench space of 18 by 18 inches.

The other tap sharpening outfit is designated as the No. 10. It is of practically the same construction as the drill sharpening machine described in April MACHINERY, page 644, and it is operated in the same manner. Two emery wheels are mounted on the motor shaft of this equipment. It is intended for sharpening taps up to 1/4 inch.

#### ADJUSTABLE LIMIT SNAP GAGE

The adjustable limit snap gage here illustrated has been placed on the market by the Swedish Gage Co. of America, Woodward Ave. and E. Grand Blvd., Detroit, Mich. This gage has a gray iron frame equipped with an aluminum disk for marking working limits. The frame is



Portable Electric Drill Equipped with Right-angle Drive for Saws, Grinding Wheels, Drills, and Other Tools

also provided with an insulated grip consisting of two pressedsteel concave pieces which are knurled. The two halves are insulated from the frame by a cushion of dead air retained by fiber washers.

One end of the frame has a solid non-adjustable flat toolsteel anvil. This anvil is lapped parallel with the two adjustable tool-steel gaging plugs on the opposite end. The plugs and anvil are beveled to aid the user in sliding the gage on work without marring finished surfaces.

The gaging plugs have an end movement only, their position being adjustable by means of fine screws. Once adjusted, the plugs are clamped in position by a wedge lock. The screws can be readily sealed to prevent tampering.

#### RIGHT-ANGLE DRIVE FOR ELECTRIC DRILLS

Portable electric drills manufactured by the Millers Falls Co., Millers Falls, Mass., may now be

equipped with a right-angle drive as illustrated. By the use of a drill in combination with this drive, together with the proper accessories, such operations as sawing, sanding, grinding, boring, polishing, etc., can be performed with a large saving of time and work.

This right-angle drive is applicable to the No. 514 1/4-inch heavy-duty or the No. 516 5/16-inch portable electric drills made by this concern. It is available in three speed ratios to suit the particular service for which the equipment is intended. The drive is equipped with ball bearings.

#### OXYGEN AND ACETYLENE MANIFOLDS

Two small-capacity manifolds which provide small users of oxygen and acetylene with economical means of gas distribution have been placed on the market by the Oxweld Acetylene Co., 30 E. 42nd St., New York City. These manifolds are especially suitable for use where it is necessary to have a number of weld-

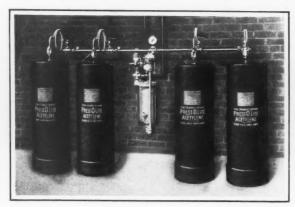
ing stations and the consumption of the gases is not large enough to warrant the installation of an acetylene generator and a large oxygen manifold.

Both manifolds are of the wall type. The acetylene manifold is a four-cylinder style, as may be seen in the illustration, which permits the use of either one, two, three, or four cylinders at the same time. The oxygen manifold, which is unillustrated, is of a six-cylinder design. Three of the cylinders may be changed while the other three maintain the oxygen supply.

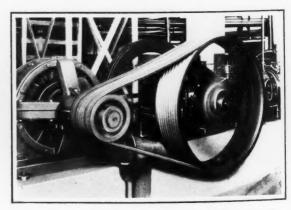
#### WORTHINGTON "MULTI-V-DRIVE"

A drive consisting of a number of endless, molded, rubberized-cord V-belts running in V-grooved sheaves has recently been placed on the market by the Worthington Pump & Machinery Corporation, Harrison, N. J. This drive was developed in conjunction with the Goodyear Rubber & Tire Co. The load-carrying members of the belts are highgrade cotton cords arranged in parallel lines and concentrated about the neutral axis.

Each sheave is finished so that the grooves present smooth surfaces on which the belts run. The wedging action produced between the belts and the grooves results in a slipless powerful grip. It is claimed that this drive will transmit about 99 per cent of the applied power at high-speed ratios, over short centers, without the need of idlers.



Manifold which Permits the Use of One, Two, Three or Four Cylinders of Acetylene



Worthington "Multi-V-Drive" which Consists of Rubberized-cord V-belts and Grooved Sheaves

#### CLARK "TRUCWELDER"

Mobile welding equipment that may be used on machinery repair jobs and on many types of production work as well is being placed on the market by the Clark Tructractor Co., Battle Creek, Mich. This equipment consists of a self-contained, gasoline-powered electric arc-welding unit capable of twenty-four hours of continuous operation. It, is known by the trade name of "Trucwelder."

Arc-welding current ranging from 60 to 250 amperes at 25 volts is developed by a self-excited General Electric arc-welding generator driven by a heavy-duty four-cylinder gasoline engine that develops 20 horsepower at 1480 revolutions per minute. Currents between 25 and 60 amperes may also be obtained through the use of a current re-The current ducing resistor. available is ample for use with all commercial sizes of metallic electrodes from 1/16 to 3/16 inch and also for light carbon welding or cutting.

#### LINCOLN LARGE-SIZED WELDER

A welding outfit of 600-ampere rating has recently been placed on the market by the Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio, as a result of a demand for high welding current to be used with large-sized metallic and carbon electrodes. This welder may also be used to supply current for the "Electronic Tornado" process of automatic carbon arc welding.



Clark Mobile Self-contained Welding Outfit

The new welder is available in either the portable-truck type or the stationary-truck type. It is a motor-driven single-operator variable-voltage machine, and has a current range of from 180 to 750 amperes. The motor and generator are direct-connected. The working mechanism of all controls is contained in a ventilated enclosed steel cabinet. Hand regulators and switches are mounted on a panel which forms one side of the cabinet. A combined voltmeter and ammeter known as a "volt-ammeter" makes possible the reading of the voltage and amperage from one dial. It also eliminates the need of a separate ammeter, which would be given excessive wear.

#### FEDERAL BENCH-TYPE WIRE GAGE

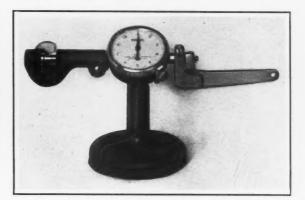
A bench-type wire gage graduated to 0.0001 inch, which is intended for measuring all kinds

of small wire, has been added to the line of precision measuring instruments manufactured by the Federal Products Corporation, 1144 Eddy St., Providence, R. I. From the illustration it will be seen that this gage is equipped with a lever arrangement that can be operated either by hand or foot. In the latter case, a wire or cord is attached to the outer end of the lever and extended down through the bench to a foot-pedal.

In operation, the inspector pulls the lever down to open the anvils. He then draws the wire through and takes readings at any point where he may desire. Each numeral on the dial represents 0.001 inch. The indicator can be swiveled on the bracket to bring the face toward the operator regardless of his position when taking readings. The small metal piece seen at the back of the anvils is a guide which insures that the wire drawn through the gage will always be in the center



Lincoln Welder with a Current Range of 180 to 750 Amperes



Federal Bench Type of Wire-measuring Indicator Gage



Fig. 1. Brown & Sharpe Index Base for Use on Milling Machines

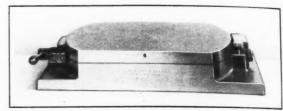


Fig. 2. Another Milling Machine Index Base with Plain Top

rigidity.

operated by a hand-lever. The

swivel can be indexed through

360 degrees with working posi-

tions at 0 and 180 degrees. The

contact surfaces are scraped to insure correct alignment and

A reversible tongue is fur-

nished for aligning the bases on

the table of the milling machine,

and a tongue slot may be cut in

the swivel for aligning fixtures.

Various types of fixtures can be

bolted and doweled to the swivel.

It is intended that a fixture be

mounted at each end of the

swivel so that while work in one

fixture is being milled, the opposite fixture can be reloaded

ready for indexing into the work-

ing position as soon as work in

EXPLOSION-RESISTING

**MOTORS** 

of the anvils. The frame and anvil-carrying block are finished in black, while all other parts are chromium-plated.

#### "PROMAL"—A NEW METAL FOR CHAINS

A new line of cast chains having remarkable strength and durability has been placed on the market by the Link-Belt Co., Indianapolis, Ind. These chains are the result of an extended research conducted to provide longer life for drive and conveyor chains operating under heavy loads or abrasive conditions. Experimentation with cast chain metals led to the discovery of a new method of processing malleable iron which so alters its physical characteristics as to make it a distinctly new metal. This fact was recognized by giving the metal the distinctive name of "Promal."

Compared with malleable iron, "Promal" has an average yield point of 45,000 pounds per square inch, as against 36,000 pounds per square inch; an average ulti-

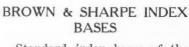
mate strength of 65,000 pounds per square inch, as against 54,-000 pounds per square inch; an average elongation of 14 per cent, as against 18 per cent; and a Brinell hardness of 170 to 190, as against 110 to 130. Compared with mild carbon cast steel, annealed, "Promal" has an average yield point of 45,000 pounds per square inch, as against 34,000 pounds per square inch; an average ultimate strength of 65,000 pounds per square inch, as against 60,000 pounds per square inch; an average elongation of 14 per cent, as against 26 per cent; and a Brinell hardness of 170 to 190, as against 120 to 140.

It is claimed, therefore, that "Promal" possesses to a high degree the qualities desirable in sprocket chain material - that is, toughness for resisting tension without permanent stretch, strength in proportion to weight and size, and hardness to offer resistance to abrasive wear. Temperatures up to 1000 degrees F. will not cause the metal to become brittle.

#### The Master Electric Co., Day-

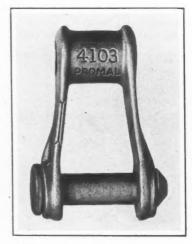
progress is completed.

ton, Ohio, has placed on the market a line of explosion-resisting motors especially intended for use where explosive vapors are encountered, as in spray booths,



Standard index bases of the designs shown in Figs. 1 and 2 have been added to the extensive line of milling machine attachments made by the Brown & Sharpe Mfg. Co., Providence, R. I. These bases are designed primarily for use on B & S plain milling machines which possess automatic or semi-automatic table movements.

Both sizes consist of a heavy base, which is bolted to the table of the machine. On this base there is a swivel which rotates on a heavy pivot. It may be locked and held rigidly in position by means of a taper plunger



Typical Link-Belt "Promal" Chain Link



Explosion-resisting Motor Made in Sizes of 1/8 to 1/3 H.P.

around gasoline pumps, etc. Interchangeable frames permit single-phase, polyphase, and direct-current motors of the same horsepower, speed, and current rating to be installed on the same mounting. These motors are available in sizes of from 1/8 to 1/3 horsepower, inclusive. They are made in both vertical and horizontal styles.

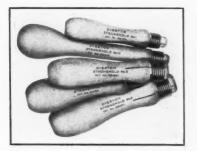
#### OLIVER PORTABLE WOOD BORER

A portable motor-in-head vertical single-spindle wood borer has been added to the line of patternshop and wood-working machinery built by the Oliver Machinery Co., Grand Rapids, Mich. This machine will bore holes up to 3/4 inch diameter in hard wood, and up to 1 1/2 inch diameter in soft woods, to a depth of 4 inches. Holes may be produced in the edge of board 22 inches wide with the table in use, and in the edge of boards or doors 36 inches wide without the table.

The machine is driven by a 1/2-horsepower ball-bearing motor which may be operated from a light socket. It is equipped with a hold-down device, which is mounted on a saddle on the column and can therefore be adjusted quickly. The machine occupies a floor space of 24 by 28 inches.



Oliver Portable Machine for Boring Holes in Wood



Disston File Handles with Slotted End and Spring Ferrule

#### DISSTON FILE HANDLES

"Stronghold" file handles recently placed on the market by Henry Disston & Sons, Inc., Philadelphia, Pa., are shown in the accompanying illustration. These handles have a coiled steel-spring ferrule, and there is a slot in the file end of the handle to provide for expansion and contraction of this end. Tangs of various thicknesses can be easily inserted and removed, the spring holding them firmly.

These handles are made from hard wood in five different sizes: No. 1 accommodates files from 3 to 6 inches; No. 2, from 6 to 10 inches; No. 3, from 10 to 12 inches; and No. 4, 14-inch files. The No. 0 is a handle designed to meet special requirements of the Disston Works.

#### ETTCO LARGE-SIZED TAPPING ATTACHMENT

A sensitive tapping attachment having a capacity up to 7/8 inch in steel and 1 inch in cast iron has been developed by the Ettco Tool Co., Inc., 600 Johnson Ave., Brooklyn, N. Y. As may be seen in Fig. 2, this attachment is provided with a multiple-disk clutch for driving the tap in and a ball-type positive clutch for reversing the tap, the ratio being about 1.7 to 1.

The multiple-disk clutch consists of alternate plates of vulcanized fiber and saw steel. Pressure is applied to the plates by three fingers so designed as to amplify by about 8 to 1 the pressure imparted to the feed-lever of the drilling machine. Even pressure on the fingers is assured by a ring which rests on a spher-

ical surface of the spindle to which the tap-holding chuck is attached. Because of the even pressure, the clutch has an unusually smooth operation. In addition, this ring allows a floating action. The clutch is so proportioned that it will slip whenever the tap is in danger of breaking. It will also slip when the tap hits the bottom of a blind hole. Provision is made to compensate for clutch wear.

The reversing clutch runs lefthanded as the machine spindle rotates in the right-hand direction. Three balls indented in the spindle of the tap-holding chuck drop into sockets in the reversing clutch when the drilling machine lever is reversed to withdraw the tap.

Another feature of the attachment is the use of a single-row ball bearing for holding the case in place. A ball bearing of this type allows the entire case to float a sufficient amount to compensate for inaccuracies in the tap or in the alignment of the work. The entire attachment constitutes a floating tap-holder. The case is made with an aluminum top and a cast-iron bottom. All journals are hardened and ground and run in bronze bushings.

The Ettco Tool Co. has developed a tap-holding chuck with a capacity for taps up to one

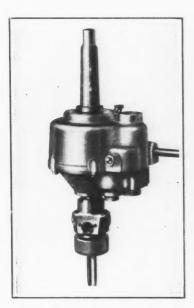
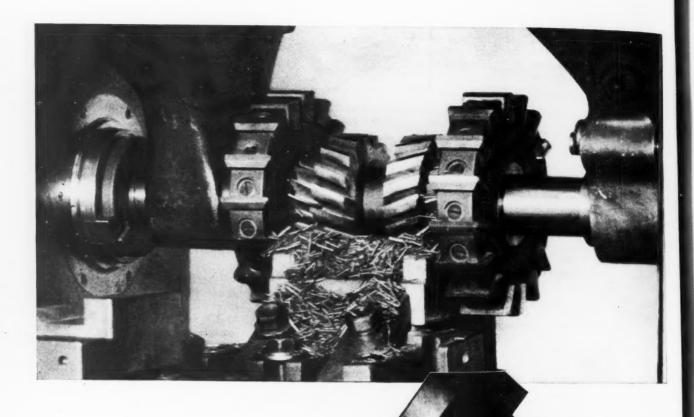


Fig. 1. Ettco Tapping Attachment for Taps up to One Inch

#### 22 Pieces per Hour



The Cost of

Time Lost Removing Cutters Plus Time Lost Replacing Cutters

Plus Lost Production Plus Sharpening Cutters Plus Original Purchase

Equals Real Cost of Cutters

como

What is the Real Cost of Your Cutters?

Eight Surfaces—milled rapidly and accurately. The Brown & Sharpe Cutters, at a minimum number of interruptions for sharpening, maintain satisfactorily the fixed distances and relationship between the surfaces.



Brown

#### -200 per Sharpening

A cast iron vise slide—eight surfaces milled fast and accurately by a gang of Brown & Sharpe Cutters.

Two Half Side Milling Cutters, two Milling Cutters and two Inserted Tooth Side Milling Cutters remove ten cubic inches of material per minute at a spindle speed of 49 R. P. M. and a table feed of seven inches per minute.

The production schedule shows an average of twenty-two pieces per hour—a high production which is ably maintained since the gang mills two hundred pieces between sharpenings.

On every job, Brown & Sharpe Cutters afford opportunity of lowering cutter costs. Ask for your copy of Small Tool Catalog No. 31 listing a complete line of cutters. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

The rugged design, with spiral teeth and ample chip space, make it possible to maintain the fat feed required.

## Sharpe Cutters

Lower Production Costs

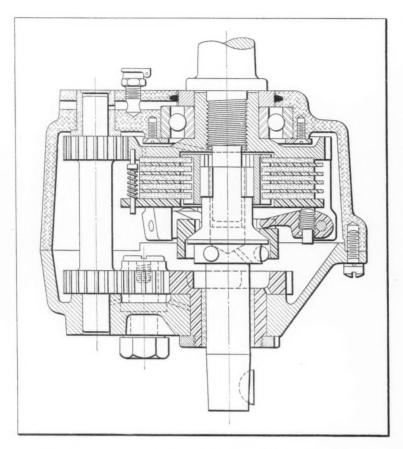


Fig. 2. Construction Details of the Ettco Tapping Attachment Shown in Fig. 1

inch to fit this attachment. With the exception of its size, this chuck is similar in design to the one illustrated in February, 1928, MACHINERY, page 486.

#### "BROWNIE" COOLANT PUMP

A vertical coolant pump especially adapted for centerless grinding machines has been added to the line of products made by the Tomkins-Johnson Co., Jackson, Mich. This pump is of centrifugal design and requires no packings. It is made in two

sizes. The No. 1 size has a capacity of 50 gallons per minute and a maximum lift of 15 feet. It is direct-driven by a 1/2-horsepower motor at a speed of 1725 revolutions per minute. Including the motor, the over-all height is 19 5/8 inches, and the pump can be placed in an 8 1/2-inch diameter circle. The diameter of the outlet pipe is 1 1/4 inches.

The No. 2 size has a capacity of 15 gallons per minute and a maximum lift of 10 feet. It is driven by a 1/4-horsepower motor, is equipped with a 1-inch

outlet pipe, and has an over-all height of 19 1/8 inches, including the motor.

The drive shaft, impeller, and protector tube of this pump comprise one unit, revolving together. With the intake at the top, the coolant is never forced upward between the housing and protector tube and never comes into contact with the ball bearings. The impeller is self-aligning.

It is claimed that this pump will handle a heavy mixture of coolant with grit or chips in it as efficiently as clean oil. It can be furnished with or without a motor or a driving pulley, and can be obtained in an acid-resisting metal.



Vertical Coolant Pump Brought out by the Tomkins-Johnson Co.

#### ENLISTING THE AID OF THE FOREMAN

The need for more thorough training in the industries is recognized. Foremen's conferences can be made a valuable adjunct to this work. The part that the foreman plays in the training of new men and the

place of foremen's conferences in the industrial training scheme will be dealt with in an article by R. D. Bundy, to be published in September Machinery. Mr. Bundy has had many years of experience in the actual management of a large industrial plant, reinforced by many more years spent in conducting foremen's

conferences in the industries in Cleveland and vicinity. He points out, in the article, what is expected of the foreman in the training of new workers, and outlines the factors that contribute to the success of foremen's conferences, and their importance in the entire scheme of industrial training.

Monotrol Lathes

#### RYERSON MACHINE TOOL LINE

Built for Accuracy Selected for Production - Ability



Ohio Horizontal Boring, Drilling and Milling Machines

Exclusive features assure permanent precision. Built in table, floor and planer table types.



Monotrol and Tritrol Lathes

Two types—both showing remarkable results on their particular work. 14 to 30 inch sizes in standard and production types.



Dreses Radial Drills

Strong, well-built, accurate tools with many time and labor saving advantages. Sizes 3 to 8 feet inclusive.



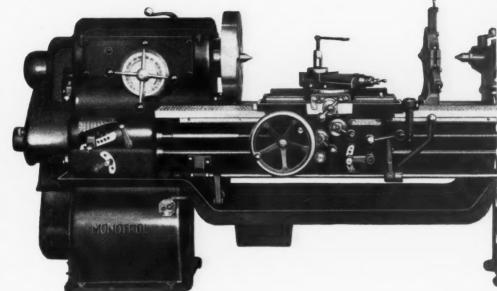
Ohio Shapers and Planers

Recognized for accuracy, speed and power. Built in all standard types and sizes.

#### RYERSON MACHINERY DIVISION

General Distributors Machine Tools

Structural and Plate Working Equipment Sheet Metal Tools Welders, Railroad Shop Machinery Small Tools, etc.



#### **Cut Production Time**

Monotrol's efficiency has not been determined by guesswork ... letters from enthusiastic users heartily endorse the many exclusive features of this super lathe. From foremen in all parts of the country comes news of production records being broken by Monotrol.

There are many reasons for this. One is the single headstock lever, controlled by one hand without the operator taking his eyes from the work.

Still others are Herringbone gears—always in mesh—and Timken bearings which work together to give a uniform and smooth spindle rotation regardless of speed.

There are so many features which place Monotrol above any other lathe you have ever seen . . . certain little details which ordinary lathes do not have.

Write for bulletins giving complete description and specifications.

#### THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO

General Distributors

JOSEPH T. RYERSON & SON, INC.

Offices in Chicago and 23 Other Principal Cities.

Sold Thru Exclusive Dealers

#### **PERSONALS**

H. D. CARLTON has resigned as president of the Consolidated Ashcroft Hancock Co., Inc., and as vice-president of Manning, Maxwell & Moore, Inc.

FRANK L. EIDMANN has resigned as Associate Professor in the School of Engineering of Princeton University to become Professor of Mechanical Engineering at Columbia University, New York.

J. L. VAN NORT has been advanced to the position of sales engineer of the Boston office of the Reliance Electric & Engineering Co., Cleveland, Ohio, manufacturer of alternating- and directcurrent motors.

A. A. Ross, of the General Electric Co., Schenectady, N. Y., has been elected chairman of the General Standardization Committee of the American Gear Manufacturers' Association, succeeding B. F. Waterman, the president.

R. L. HERMANN, formerly transportation manager of the southwestern district, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has recently been appointed heavy traction representative, with headquarters in New York.

Stewart N. Clarkson has resigned as assistant director of the National Electrical Manufacturers Association, and has established offices at 522 Fifth Ave., New York City, for the purpose of rendering trade association service to a few groups of manufacturers.

H. L. WHITTEMORE, chief of engineering, mechanics section, Bureau of Standards, Washington, D. C., has been nominated a member of the Council of the American Society of Mechanical Engineers to serve for a period of three years, beginning with the annual meeting in December, 1930.

H. W. Petty has been appointed branch sales manager for the Pittsburgh territory of the Wagner Electric Corporation, St. Louis, Mo. Mr. Petty received his education at Washington University, St. Louis, graduating in 1924, and has since that time been in the employ of the Wagner Electric Corporation.

HARVEY N. DAVIS, president of Stevens Institute of Technology, Hoboken, N. J., and WILLIAM A. HANLEY, chief engineer of the Eli Lilly Co., Indianapolis, Ind., have been nominated vice-presidents of the American Society of Mechanical Engineers to serve for two years, beginning with the annual meeting in December, 1930.

D. C. Davis, assistant treasurer of the General Electric Co., Schenectady, N. Y., retires August 1 after forty-one years of continuous service with the company. Mr. Davis was formerly connected with the Fort Wayne Electric Works as assistant treasurer. He was transferred to Schenectady in June, 1929, as general credit manager.

AARON E. CARPENTER, first vice-president of E. F. Houghton & Co., Philadelphia, Pa., manufacturers of oils and leathers, has just returned from an ex-

tended business trip to France, Germany, Poland, Russia, and England. During his trip, Mr. Carpenter obtained much valuable data on European manufacturing and marketing conditions.

ELMER C. McKenzie has been appointed assistant sales manager of the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich. John E. Wells, who has been assistant sales manager, becomes advertising manager. Mr. McKenzie was formerly with the Dura Co., Toledo, Ohio, where he was in charge of efficiency and methods.

WILLIAM H. MILLER, New England sales manager for the Pratt & Whitney Co., Hartford, Conn., has just completed forty years of service. In honor of the occasion, his associates gathered in his office as a surprise party, where he was presented with a basket of flowers and a wrist-watch suitably engraved. Clay-



W. H. Miller, who has Completed Forty Years of Service with the Pratt & Whitney Co.

ton R. Burt, president and general manager of the company made the presentation speech. Mr. Miller entered the employ of the Pratt & Whitney Co. on June 30, 1890, starting as a draftsman in the engineering department. Later he joined the selling organization of the company, and has been identified with it continuously ever since.

ERVIN G. BAILEY, president of the Bailey Meter Co., Cleveland, Ohio, has been awarded the Edward Longstreth Medal by the Franklin Institute of Philadelphia, Pa., "in recognition of his many inventions and developments of regulating and controlling devices, and measuring and recording instruments."

DAVID BARTLETT has been appointed manager of the Chicago branch of the Alexander Milburn Co., Baltimore, Md., manufacturer of oxy-acetylene cutting and welding equipment, paint spray equipment, and portable carbide lights. An increased volume of stock of all equipment will be carried by the company in Chicago for immediate delivery in that territory.

C. H. Armstrong has been appointed and the western part of the state of general manager of the Clegg Lock New York, as far as the Hudson River.

Washer Co., Chicago, Ill. He will have complete charge of production, marketing, and administration. Mr. Armstrong was formerly director of trade extension of the Textile Bag Manufacturers' Association, and at one time was assistant to the president of the Duplex Printing Press Co., Battle Creek, Mich.

JOHN A. C. WARNER has been appointed secretary and general manager of the Society of Automotive Engineers, succeeding the late Coker F. Clarkson who had held that position for the last twenty years. C. B. Veal has been appointed assistant general manager. Mr. Warner has been engaged as research engineer in charge of chassis experimental work for the Studebaker Corporation, and as superintendent of the Studebaker Proving Ground at South Bend, Ind.

WIILLIAM R. BURROWS, vice-president of the General Electric Co., Schenectady, N. Y., became chairman of the manufacturing committee of the company on July 1. Mr. Burrows has been engaged in the electrical industry since 1894. In 1917, he was made works manager of the Edison Lamp Works. In 1925 when the Edison Lamp Works and the National Lamp Works were merged, he was appointed associate manager, and in 1927 he was elected vice-president of the General Electric Co.

DON F. KENNEDY has been appointed western sales manager of Hammond & Irving, Inc., Auburn, N. Y., manufacturers of tool and alloy steel, weldless rings, and forgings. His headquarters will be at 821 Hazelwood Ave., Detroit, Mich. Mr. Kennedy was formerly western manager of the Hammond Steel Co., Syracuse, N. Y., and also operated his own tool and die business under the name of Sterling Mfg. Co. in Detroit. He has served as president of the Detroit Tool Manufacturers Association.

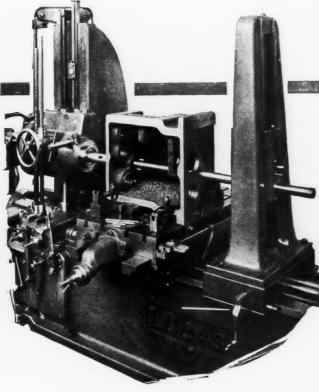
RUDOLPH E. HELLMUND, chief electrical engineer of the Westinghouse Electric Mrg. Co., East Pittsburgh, Pa., has been awarded the B. G. Lamme Medal for 1929 by the American Institute of Electrical Engineers. The medal is presented annually to the electrical engineer "who has shown meritorious achievement in the development of electrical apparatus and machinery." Mr. Hellmund was born and educated in Germany, and is a graduate of the Charlottenburg Engineering Institute. He has especially distinguished himself as a designer of induction motors.

CHARLES B. EKDAHL, for many years connected with the Pierce-Arrow Motor Car Co., Buffalo, N. Y., as supervisor of the lay-out division, in which capacity he had under his direction time-study, planning, and tool engineering, has recently opened an office at 1738 Elmwood Ave., Buffalo, N. Y., as consulting engineer, specializing in all lines of production tool engineering, special machine designing and plant lay-out work. Mr. Ekdahl will also represent the National Tool Co. of Cleveland, Ohio, in Buffalo and the western part of the state of New York, as far as the Hudson River.

# UCas

#### BORING, DRILLING and MILLING MACHINE

with Dial Indicator Indexing Device



# Provide for the Future as well as the Present

In these days of keen competition and rapid development in machine design, changes are so frequent that, except for very large production, it is dangerous to invest in expensive, large jigs or other single-purpose equipment, because you may not get your tool charge out before improvements are demanded. Then you must charge off as a loss the unabsorbed cost of jigs, or yield to the temptation to defer the improvements in your product, which might be fatal.

Avoid the dilemma, by installing the LUCAS "Precision" Horizontal Boring, Drilling and Milling Machine with Dial Indicator Indexing Device, for the accurate spacing of holes by means of standard end measuring rods, inside micrometers or special length gages.

You will get out the work accurately and efficiently and the machine will always be an asset, because its versatility makes it adaptable to a wide variety of jobs.

#### THE LUCAS MACHINE TOOL CO., Cleveland, Ohio

FOREIGN AGENTS: Allied Machinery Co., Barcelona, Zurich. V. Lowener, Copenhagen, Oslo, Stockholm. R. S. Stokvis & Zonen, Paris and Rotterdam. Andrews & George Co. Tokyo, Ing. M. Kocian & G. Nedels, Prevue, Emanuele Mascherna, Milan Italy.

#### **OBITUARIES**

GUSTAF DAVID SUNDSTRAND, inventor of the Sundstrand adding machine, died at his home in Rockford, Ill., on July 12, aged fifty years. Mr. Sundstrand was vice-president of the Sundstrand Machine Tool Co. and president of the Sundstrand Engineering Co. He was born in Stockholm, Sweden, March 8, 1880, and came to the United States with his parents in 1887. In 1907, Mr. Sundstrand established a small repair and experimental shop in Minneapolis. It was there, in 1913, that he perfected his first adding machine. Shortly afterward, he moved to Rockford, where he became associated with the Rockford Milling Co. (now known as the Rockford Machine Tool Co.) established by his brother Oscar and his brother-in-law Edwin Cedarleaf. He then secured a patent on his adding machine, and started manufacture on a commercial basis.

HENRY DRESES, for many years well known in the machine tool industry as founder and former president of the Dreses Machine Tool Co., Cincinnati, Ohio, died recently while in Europe. Over ten years ago Mr. Dreses retired and sold out his interest to Charles E. Gilbert, now president of the company.

#### NEWS OF THE INDUSTRY

CHASE BRASS & COPPER CO., INC., Waterbury, Conn., has opened a new warehouse in Pittsburgh, Pa., where a complete stock of brass and copper products will be available for immediate shipment.

Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo., announces the combination of the sales office and service station in the Atlanta territory in a new fireproof building at 14-20 Alexander St., N.W., Atlanta, Ga.

PATTERSON TOOL & SUPPLY Co., 123-125 E. Third St., Dayton, Ohio, announces that at the recent election of officers, William Blake Patterson was elected president and treasurer; F. S. Patterson, vice-president; and M. L. Patterson, secretary.

GENERAL ELECTRIC Co., Schenectady, N. Y., announces that the industrial heating and welding department has been divided into two sections. C. L. Ipsen is manager of sales of the industrial heating section, and L. D. Meeker, of the electric welding section.

SUPERIOR CHARCOAL IRON Co., Grand Rapids, Mich., has taken over the charcoal pig iron sales of the Newberry Lumber & Chemical Co. This gives the Superior company three furnaces with an annual production capacity of 100,000 gross tons of Lake Superior charcoal pig iron.

A. O. SMITH CORPORATION, Milwaukee, Wis., is constructing a seven-story building to be used exclusively for engineer-

ing and research work. A large staff of engineers and scientists will carry on their work of invention and discovery in this building, which is provided with unusual research facilities.

Pomona Pump Co., Pomona, Cal., has started construction on two factory buildings. One of these, 140 by 175 feet, of all-steel construction with sawtooth roof and concrete floor, will be used as a machine shop; the other building, of similar construction, will be occupied by the company's service department.

U. S. ELECTRICAL MFG. Co., Los Angeles, Calif., has added approximately 25 per cent to its factory floor space, this being the third time within twelve months that the manufacturing facilities of the company have been enlarged. The company specializes in the manufacture of asbestos-protected "AutoStart" motors in sizes up to 150 horsepower.

Louis Allis Co., Milwaukee, Wis., manufacturer of direct- and alternating-current motors, announces the recent opening of sales offices at 1715 Union Bank Building, Pittsburgh, Pa., with C. O. Sargent in charge; at 215 B E. Archer St., Tulsa, Okla., with W. Woobank in charge; and at 4441 Santa Fé Ave., Los Angeles, Cal., with A. R. Thomas in charge.

Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa., announces that, through its subsidiary, the Westinghouse Electric International Co., it has joined with a group of Spanish financial and industrial leaders in the formation of a new company, known as Constructora Nacional Maquinaria Electrica, to manufacture electric generators, motors, transformers, and other electrical apparatus in Spain.

A. M. Byers Co.. Pittsburgh, Pa., manufacturer of wrought iron, is building and equipping a new plant involving an investment of approximately twelve million dollars for use in connection with the Byers new process for tonnage production of wrought iron, which was developed by Dr. James Aston, director of mining and metallurgy at Carnegie Institute of Technology and consulting metallurgist for the A. M. Byers Co.

CUTLER-HAMMER. INC., 1204 St. Paul Ave., Milwaukee, Wis., announces that the company has acquired all the common stock of Schweitzer & Conrad, Inc., Chicago. Ill., manufacturers of high-voltage equipment. The latter company will continue to operate as an independent manufacturing and selling unit. Mr. Conrad and Mr. Schweitzer have been retained as consulting engineers. and will maintain their interest in the management as members of the board of directors.

WEAN ENGINEERING Co., INC., Warren, Ohio, announces that the company has acquired the exclusive license to manufacture and sell the Mulholland oscillating polishing machine for polishing chrome-nickel and other highly finished sheets. These machines were developed by David E. and Walter Mulholland,

Norwich, N. Y., with the assistance of Dr. F. C. Langenberg of Burlington, N. J. Messrs. Mulholland and Dr. Langenberg will continue to act in the capacity of technical advisors to users of the equipment.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the organization of a new company to be known as the Westinghouse X-Ray Co., Inc. Two of the largest companies now engaged in the X-ray field, the Wappler Electric Co. of Long Island City, and the American X-Ray Corporation of Chicago, will be identified with this organization. The officers of the Westinghouse X-Ray Co., Inc., are: A. E. Allen, president; Calvert Townley, vice-president; Warren H. Jones, secretary; and T. J. Illing, treasurer.

DIAMOND CHAIN & MFG. Co., Indianapolis, Ind., is announcing new stock drives for all standard power applications. The Diamond stock drive consists of a Diamond roller chain and two Diamond sprockets, ready to be installed. They are carried in stock by distributors and supply houses in all the large cities in single to quadruple strands, from 1/4 to 75 horsepower, in ratios up to 8.4 to 1, and for motor speeds up to 1750 revolutions per minute. These new drives supplement the regular line of Diamond high-speed drives.

Tube-Turns, Inc., Shelby St. and Goss Ave., Louisville, Ky., manufacturer of seamless drawn fittings for welded piping, has completed and placed in operation an addition to the company's plant which will increase its production by 60 per cent. The expansion of the manufacturing facilities was made necessary by the increased sales of the company, which during the first five months of 1930 have been nearly three times as great as during the corresponding period of last year, the plant having operated of late twenty-four hours a day, six days a week.

EX-CELL-O AIRCRAFT & TOOL CORPORA-TION, 1200 Oakman Blvd., Detroit, Mich., announces several changes in personnel, following the recent merger with this organization of the Air Parts & Tool Corporation, the Wolverine Screw Co., and the Continental Tool Works. Ernest V. Squires, who formerly was with the Continental Tool Works, has been appointed the Ex-Cell-O representative for the district handled from Holly and Pontiac, Mich. H. J. Snell and W. Maxwell Gray, formerly salesmen for the H. R. Krueger Co., are handling the Ex-Cell-O line from the Detroit office. R. C. Perry, who was connected with the Wayne Tool Co., is handling the Wayne line, especially dies and fixtures. Frank V. Strother has been transferred from the New York office to the Cleveland territory. The various plants recently merged with the Ex-Cell-O Aircraft & Tool Corporation, except the Continental Tool Works, have now moved into the new plant on Oakman Boulevard.



# ADJUSTABLE

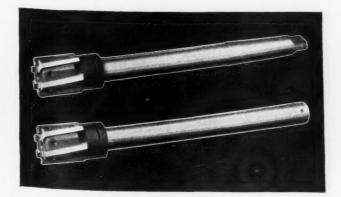
The makers of each Wetmore Reamer take pride in its perfection. They are guided by the thought that each reamer, when completed, will be used by the kind of men who take pride in their work. That is one of the reasons why Wetmore, for many years, has been known throughout industry as "The Better Reamer".

Write for latest catalog of all types of Wetmore Machine and Cylinder Reamers and replacement blades.

WETMORE REAMER COMPANY

60 27th STREET

MILWAUKEE, WISCONSIN



#### WETMORE Type No. 11 HEAVY-DUTY REAMERS

With straight or taper arbor integral. Combines all the advantages of both solid and adjustable reamers. Left-hand angle blades prevent "digging in", chattering, and scoring by the reamer while backing out. The 1/8" projection of blades over end of reamer body allows chips to fall off ahead of reamer, so that they do not clog up along cutting edge of blades. Wide range of adjustment provides for wear and regrinding. Sizes range from 1" to 3", inclusive.

#### NEW BOOK ON MECHANISMS

INGENIOUS MECHANISMS FOR DE-SIGNERS AND INVENTORS. Edited by Franklin D. Jones. 536 pages, 6 by 9 inches. Published by THE INDUSTRIAL PRESS, 140-148 Lafayette St., New York City. Price, \$5.

This new book contains illustrated descriptions of a large variety of standard and special mechanisms selected by experienced machine designers as outstanding examples of clever mechanical movements. Many of the most unusual and ingenious mechanisms ever devised are described and illustrated in this treatise. Three hundred line engravings are used throughout the book to illustrate the arrangement of the various mechanisms.

This book is the work of 110 experienced designers and engineers located throughout the world, and the particular mechanisms described and illustrated have all been submitted to the publish-

ers as exceptionally fine examples of well designed movements. Results that at first thought might appear to be impossible often are obtained mechanically by very simple, direct forms of mechanisms such as are described in this book. Practically every mechanism included embodies some idea or principle that may be adapted to various purposes.

This book will enable any designer draftsman to acquire an expert knowledge of the general subject of mechanisms. The descriptions and illustrations are confined to the important elements or units in automatic machine design, so that time is not wasted in reading about a lot of unessential detail. For example, in the chapters dealing with intermittent motions, stop mechanisms, reversing mechanisms, overload relief mechanisms, interlocking devices, speed-changing mechanisms, and so on, the descriptions relate only to the actual devices or units that perform these different functions. The reader is told plainly and briefly just what each mechanism does and how it operates. These

various unit mechanisms or mechanical devices have actually been applied to a great many different types of automatic machines and other mechanical appliances, and this book provides a very complete course of study.

The publishers of this book have been collecting material for about fifteen years. To assist in this work, prize competitions have been conducted in connection with Machinery, thus reaching many designers both here and abroad. This new book also contains the best of the matter from the former work "Mechanisms and Mechanical Movements" to insure completeness. All the mechanisms described are grouped, as far as possible, into chapters according to general types, which, in addition to the complete index, greatly facilitates finding whatever class of mechanical movement is desired. This arrangement also brings together many mechanisms that are alike as to function and purpose but differ entirely in design; consequently, such mechanisms may readily be compared.

#### COMING EVENTS

AUGUST 24-29—Third International Congress of Applied Mechanics to be held at the Royal Technical Institute, Stockholm, Sweden. Further information may be obtained by addressing the American Society of Mechanical Engineers, 29 W. 39th St., New York City.

AUGUST 27-31—Industrial Conference under the auspices of the Industrial Department of the Y. M. C. A. at Silver Bay on Lake George, N. Y. E. H. T. Foster, secretary, 347 Madison Ave., New York City.

SEPTEMBER 22-26—Annual convention of the American Society for Steel Treating at the Stevens Hotel, Chicago, Ill. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

SEPTEMBER 22-26—Twelfth Annual National Metal Exposition under the auspices of the American Society for Steel Treating at the Stevens Hotel, Chicago, Ill. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, O.

SEPTEMBER 22-26—National Metal Congress at the Stevens Hotel, Chicago, Ill., in conjunction with the annual convention of the American Society for Steel Treating and the annual fall meetings of the Metals Division and the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers; the Iron and Steel Division and the Machine Shop Practice Division of the American Society of Mechanical Engineers; and the American Welding Society.

SEPTEMBER 29-OCTOBER 1—Semiannual meeting of the American Gear Manufacturers' Association at Niagara Falls, Canada; headquarters, Hotel Clifton. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

OCTOBER 7-8—Production Meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich. R. S. Burnett, director, production activities, Society of Automotive Engineers, 29 W. 39th St., New York.

OCTOBER 15—Annual meeting of the Gray Iron Institute in Cleveland, Ohio. Manager, A. J. Tuscany, Gray Iron Institute, Cleveland, Ohio.

DECEMBER 1-6—Ninth National Exposition of Power and Mechanical Engineering in the Grand Central Palace, New York City.

DECEMBER 1-6—Fifty-first annual meeting of the American Society of Mechanical Engineers in the Engineering Societies Building, New York City. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

FEBRUARY 16-20, 1931—Second National Western Metal Congress and Exposition to be held in the Civic Auditorium, San Francisco, Calif., under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

#### NEW BOOKS AND PUBLICATIONS

AMERICAN STANDARDS YEAR BOOK (1930). 104 pages, 7 1/2 by 10 1/2 inches. Published by the American Standards Association, 29 W. 39th St., New York.

FIRST-AID SERVICE IN SMALL INDUSTRIAL PLANTS. 20 pages, 5 1/2 by 7 3/4 inches. Published by the Metropolitan Life Insurance Co., 1 Madison Ave., New York City, as No. 1 in the Industrial Health Series of the Policyholders' Service Bureau.

PROTECTION OF WORKERS OPERATING METAL-WORKING PRESSES. Studies and Reports, Series F, No. 4, of the International Labor Office, Geneva, Switzerland. 123 pages, 6 by 9 inches; 121 illustrations. Published by P. S. King & Son, Ltd., Orchard House, 14 Great Smith St., Westminster, London, S.W. 1, England. Distributed in the United States by the World Peace Foundation, 40 Mount Vernon St., Boston, Mass. Price, \$1.25.

This book contains a comprehensive study of the safety appliances available for use in connection with power presses. The book should be of considerable interest to manufacturers and users of equipment of this kind, as well as to press and die designers.

MY AUTOMOBILE: ITS OPERATION, CARE, AND REPAIR. By Harold F. Blanchard. 373 pages, 6 by 9 inches; 227 illustrations. Published by the Scientific Book Corporation, New York City. Price, \$3.50.

This is a handbook for automobile owners and drivers, describing the care and operation of various types of cars and giving step-by-step

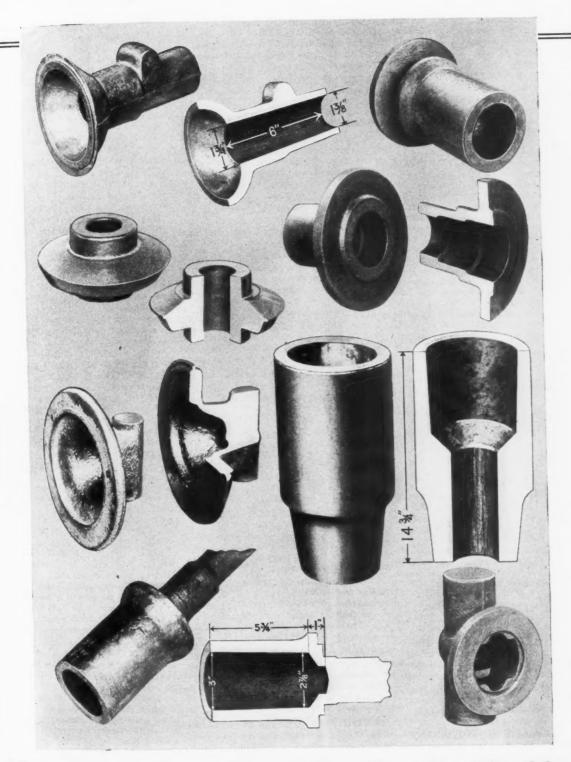
instructions for finding and remedying automobile difficulties. Different chapters deal with the mechanism of automobiles, engine repairs, lubrication, the cooling system, the fuel system, the carburetor, the electrical system, starting and lighting troubles, engine troubles, clutch, transmission, rear axle, wheel, and brake difficulties, the steering mechanism, springs, and tires. Every automobile owner should find this book useful.

ELECTRICITY FOR BEGINNERS. By Edward Harper Thomas. 172 pages, 5 by 7 inches; 24 illustrations. Published by the Norman W. Henley Publishing Co., New York City. Price, \$1.50.

This text-book is characterized by the simplicity of the treatment and the clear language and diagrams used in the text. The lessons in the book, which were written originally formanual training classes, deal with a rather difficult subject in a way that will be readily understood by students of limited preliminary training. The book should be found valuable as an introduction to a more advanced study of the subject. It covers a broad field of the applications of electricity, and contains a great amount of useful information boiled down into brief, easily assimilated chapters. It should prove useful in the classroom as well as for home study.

PRINCIPLES OF ENGINEERING ECON-OMY. By Eugene L. Grant. 387 pages. 6 by 8½ inches. Published by the Ronald Press Co., New York City. Price, \$3.75.

The author of this book states in the preface that nearly all engineering problems involve considerations and comparisons of cost, and yet a recent survey by the Society for the Promo-tion of Engineering Education has brought out the fact that among engineering graduates there is a general feeling that the most serious fault in their technical education was the failure toemphasize the economic aspects of engineering. For this reason, this work has been written primarily for students of engineering, but it will also be found useful by engineers and others engaged in the industry. While there is a wealth of literature dealing with shop managethere are ment and business administration, very few treatises on the economical problems of engineering, and the present work should prove of value to a great number of engineers.



#### **Ajax Heavy Duty Upsetting Forging Machines**

are daily producing forgings of these types with intricate contours, thin flanges, internal recesses, thin walls and long pierced holes at tremendous savings in stock and machining. Your forging problems, submitted to Ajax engineers, will receive the benefit of their wide and up-to-the-minute experience in the production of this class of forgings.

#### THE AJAX MANUFACTURING COMPANY

621 Marquette Bldg. Chicago, Ill. Euclid Branch P. O.
Cleveland, Ohio

1369 Hudson Terminal New York City The work is divided into chapters, and the chapters, in turn, into subdivisions, each dealing with a specific subject, the arrangement making it very easy to obtain a comprehensive idea of the contents.

ENGINEERING KINEMATICS. By William G. Smith. 343 pages, 6 by 9 inches: 420 illustrations. Published by the McGraw-Hill Book Co., New York City. Price, \$3.50.

This is the second edition of this book, a revision of the work having been made necessary by the great activity recently shown by industrial concerns in their research, develop-ment, and design departments. In the comparatively few years since the first edition was published, there have been many almost revolutionary changes in machine design, especially in the design of gears of various types, making much that was contained in older books on kinematics obsolete. In addition to incorporating recent developments, the author has rearranged the order of presenting the subject into what he considers a more logical progression The book is divided into nine chapters as follows: Definitions and Fundamentals; Direct-contact Pairs, Rolling Curves, Friction Transmission; Toothed Gearing for Parallel Shafts: Gears on Non-parallel Shafting: Gear Trains: Cams and Their Uses: Determination of Relative Velocities and Accelerations of Simple Linkwork Parts; Practical Application of Linkwork; Belt, Rope, and Chain Trans-mission. An appendix deals with attachments to supplement standard transmissions.

#### SOCIETIES, SCHOOLS AND COLLEGES

HEBREW TECHNICAL INSTITUTE, Stuyvesant and Ninth Sts., New York City. Catalogue for 1930, containing calendar, outline of courses, etc.

ELECTRICAL ASSOCIATION OF NEW YORK, 100 E. 45th St., New York City. Electrical Handbook, containing twelve sections covering illumination, industrial control, industrial heating, material handling, motors, refrigeration, signals, signs, switchboards and panel boards, tools, ventilation, and wiring. Information of value to both the buyer and seller of such equipment is given.

#### NEW CATALOGUES AND CIRCULARS

SHEAR KNIVES. Heppenstall Co., Pittsburgh, Pa. Catalogue covering shear knives for many varied purposes in the metal industries.

ELECTRIC MOTORS. U. S. Electrical Mfg. Co., Los Angeles, Calif. Bulletin illustrating and describing the company's "Doublenclosed" motors.

ELECTRIC WELDING EQUIPMENT.
Thomson-Gibb Electric Welding Co., Bay City,
Mich. Circular entitled "Experience is the
Best Teacher."

INDUSTRIAL LOCOMOTIVES. General Electric Co., Schenectady, N. Y. Circular GEA-1229, covering trolley type, 60-ton industrial haulage locomotives.

ELECTRIC HOISTS. Ambold Machine Tool Corporation, 50 Church St., New York City. Circular illustrating and describing Demag Junior double-acting hoists.

CORROSION RESISTING METAL. American Manganese Steel Co., 6600 Ridge Ave., St. Louis, Mo. Circular describing tests made on Fahralloy pipe and fittings.

CHISELS. Cleveland Punch & Shear Works Co., Cleveland, Ohio. Circular illustrating the pneumatic chisels, hand cold chisels, and chisel blanks supplied by this company.

INDUSTRIAL GEARS. Boston Gear Works Sales Co., North Quincy, Mass. Catalogue 49, covering this company's products, including gears, chain drives, speed reducers, couplings, pulleys, etc.

ELECTRIC MOTORS. Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland. Ohio. Bulletin 107, illustrating and describing fully enclosed fan-cooled induction motors with ball bearings.

NON-METALLIC GEARS. General Electric Co., Schenectady, N. Y. Bulletins on non-metallic gears and blanks, giving data for ordering, application data, and price lists of Fabroil gears and blanks.

REAMERS. McCrosky Tool Corporation, Meadville, Pa. Circular entitled "Engineering Small Tools for Big Production." illustrating and describing McCrosky reamers and Wizard quick-change chucks and collets.

INSTRUMENTS. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. A 48-page text-book on hydrogen ion measurements as applied to the measurement of the concentration of hydrogen ions in a water solution.

ELECTRIC FURNACES. Hevi Duty Electric Co., Milwaukee, Wis. Bulletin 630, entitled "Serving an Industry Better," illustrating and describing the company's new office and plant at 4100 Highland Blvd., Milwaukee.

WELDING EQUIPMENT. Fusion Welding Corporation, 103rd St. and Torrence Ave., Chicago, Ill. Bulletin 6, describing a new process of welding mild steel plates and the Yellow Jacket Weldite electrodes used in connection with this process.

MILLING MACHINES. Sundstrand Machine Tool Co.. Rockford, Ill. Catalogue entitled "Only the Head is Special," illustrating and describing a great number of Sundstrand Rigidmils provided with special heads for different classes of milling.

AUTOMATIC TURNING MACHINES. Gisholt Machine Co., Madison, Wis. Service bulletins illustrating and describing numerous operations performed on the Gisholt Simplimatic. Also, service bulletins covering work performed on turret lathes.

GEAR BURNISHING MACHINES. City Machine & Tool Works, 1517-31 E. Third St., Dayton, Ohio. Circular illustrating and describing the Bolender Model 2 gear-burnishing machine. The details of construction are explained, as well as the method of operation.

ROLLER BEARINGS. Timken Roller Bearing Co., Canton, Ohio. Booklet entitled "Timken Bearings in Rubber Mill Equipment," covering mounting practice and application of tapered roller bearings to almost every kind of machine used in the rubber industry.

TRANSMISSION EQUIPMENT. American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa. Catalogue of pulleys, shaft hangers, hand trucks, reels, spools, beams, and miscellaneous stampings. The catalogue contains 128 pages illustrating, descr.b.ng, and tabulating the equipment covered.

SCREW CONVEYOR DRIVES. H. W. Caldwell & Son Co., 2410 W. 18th St., Chicago, Ill. Catalogue 1191, illustrating and describing the complete line of Caldwell screw conveyor drives. showing typical installations and giving data of value to engineers selecting equipment of this kind.

SPECIAL MACHINERY. Hartford Special Machinery Co., 293 Homestead Ave., Hartford, Conn. Booklet entitled "Our Machine Equipment," illustrating and listing the equipment available in the company's plant for building special machinery and shop equipment of a wide variety.

TESTING INSTRUMENTS. Adam Hilger, Ltd., 24 Rochester Place, Camden Road, London, N.W. 1. England. Circular and describing the "Steeloscope," an instrument for rapidly estimating the content of nickel, chromium, molybdenum, tungsten, and other metals in steel.

ELECTRIC CONTROL EQUIPMENT. General Electric Co., Schenectady, N. Y. Catalogue GEA-606B, covering the line of industrial control equipment made by this company, including hand starters, speed regulators, drum switches and resistors, magnetic controllers, rheostats, limit switches, etc.

TRANSMISSION EQUIPMENT. Worthington Pump & Machinery Corporation, 2 Park Ave., New York City. Bulletin L-400 illustrating and describing the Worthington Multi-V. Drive for power transmission, which is said to increase the productivity of a plant by permitting the setting up of more machines in a given area.

PRESSES. Cleveland Punch & Shear Works Co., Cleveland, Ohio. Circular illustrating typical examples of the line of Cleveland presses, including double-crank toggle presses, inclinable presses, punch presses, tie-rod presses, knuckle joint presses, etc. Examples of various styles of shears, planing machines, bending rolls, etc., are also shown.

PORTABLE ELECTRIC TOOLS. Millers Falls Co., Millers Falls, Mass. Catalogue 3, illustrating and describing the Millers Falls line of electric drills and drill accessories, bench drill stands, hole saws, electric hand saws, circular saw blades, electric screwdrivers, electric hammers, bench and pedestal grinders, bufing spindles, valve refacers, and disk sanders.

STEELS. Heppenstall Co., Pittsburgh, Pa. Catalogue entitled "Serving Industry for Three Generations," outlining the history of the company and illustrating and describing the Heppenstall line of products, including acid openhearth steel, die-blocks, shear knives, forgings, electric induction steel, and alloy steel for the oil industry. Catalogue covering electric induction steel.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. General catalogue GEA-600A—a complete index of this company's products. This catalogue, which is issued every two years in the form of a bound volume, contains 1146 pages, 8 by 10½ inches, profusely illustrated. It is thumb-indexed in sixteen sections covering all the electrical products of the company.

GRINDING WHEELS. Norton Co., Worcester, Mass. Circular entitled "A New Norton Method of Marking Grinding Wheels," describing a system adopted by the company in which the markings indicate the five characteristics in which grinding wheels differ—kind of abrasives, grain (size of abrasive), grade (strength of bond), structure (amount of abrasive), and kind of bond.

GRINDING TUNGSTEN-CARBIDE TOOLS. Carborundum Co., Niagara Falls, N. Y. Booklet entitled "Some Information on Grinding Cemented Tungsten Carbide," containing general information about tungsten carbide, the kind of wheels used for grinding it, and the methods employed in successful grinding operations. The book contains thirty-two pages of detailed information.

ELECTRIC WELDING. Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland. Ohio. 40-page booklet entitled "Automatic Arc Welding by the Electronic Tornado Process." The booklet describes the method of automatic welding with the carbon arc, emphasizing its advantages. Results of tests on strength and ductility of welds are given in detail. Applications of the process in different industries are illustrated and described.

AUGUST 1930—THIRTY-SIXTH YEAR

JIII 31 1930

# MACHINERY

THE INDUSTRIAL PRESS Publishers. 140-148 LAFAYETTE ST., NEW YORK

# Ocrap those Obsolescent Machines

How many obsolescent machines are there in your plant—machines that can not keep up with today's demands in speed, production, precision, low operating charges—machines that are eating up your profits?

If you could reduce your power costs 20% with modern Timken-equipped machinery, wouldn't it pay you to scrap the obsolescent, friction-ridden power wasters?

If you could save 80 to 90% of your lubrication costs at the same time, wouldn't it be worth your while to do away with machines that need so much more lubricant?

If you could extend the productive period of your machines by eliminating involuntary shutdowns for bearing replacements, wouldn't it pay you to discard undependable equipment?

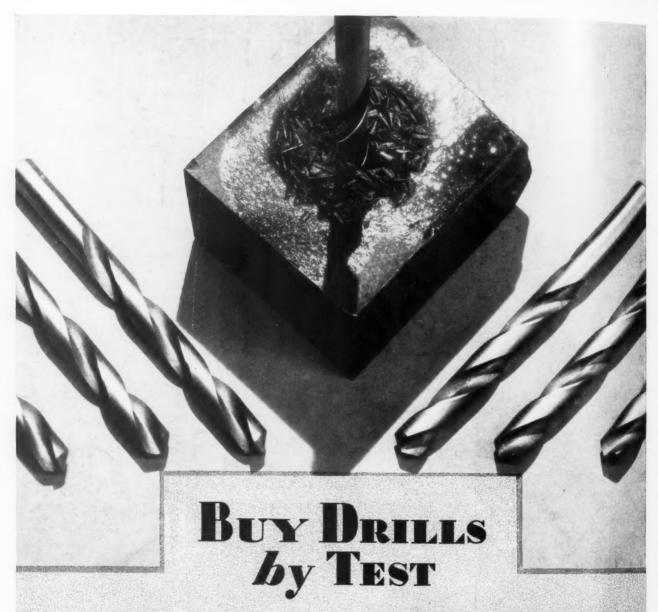
If you could produce more accurate work in less time with Timken-equipped machines, wouldn't this be a strong incentive to modernize your machinery?

If you could cut your maintenance costs 80 to 90% with Timken-equipped machinery, wouldn't it be good business to throw out machines that cost so much more for upkeep?

When you consider that all of these potential benefits are available in modern "Timken Bearing Equipped" machinery, there isn't much room left for argument. With this thought in mind, why not check up on your mechanical equipment, remembering that there is only one combination that meets every modern anti-friction requirement — the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel.

THE TIMKEN ROLLER BEARING COMPANY—CANTON, OHIO

TIMKEN Tapered BEARINGS



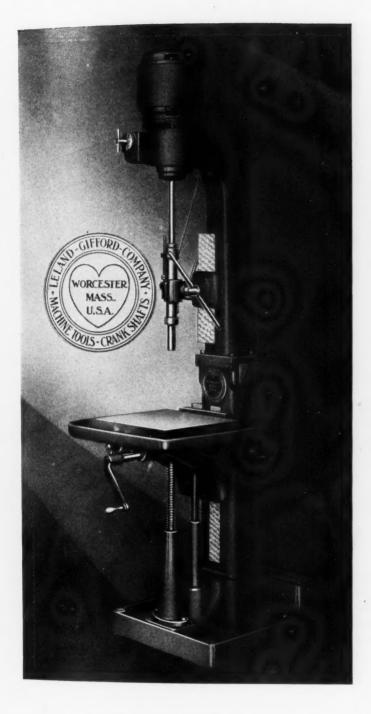
A suggestion for the user of twist drills whose annual tool cost runs into four or five figures.

- Buy by Test the cost of tests is insignificant compared with the savings to be made from shrewd drill selection.
- Buy by Test and run the tests on jobs that require large quantities of drills.
- Buy by Test and let the tests be comprehensive enough so that average results of several drills can be the deciding factor rather than the possible brilliance of an isolated drill.
- . Buy by Test and test the new Greenfield drills.



New York: 15 Warren St.
Chicago: 611 W. Washington Blvd.
Detroit: 228 Congress St., W.
Canadian Plant: Greenfield Tap & Die Corp. of Canada, Ltd.,
Galt, Ontario

Any manufacturer using drills in quantity and desiring to run a test will be furnished with the new Greenfield drills if he will write our Greenfield office.



#### Wide Range of Speeds for the Tool Room

The wide range of speeds and ability to get any one of them quickly makes this Leland-Gifford No. 2 Motor Spindle Drilling Machine particularly adaptable for tool room work.

#### Leland-Gifford Company

BRANCHES

BOSTON CHICAGO CLEVELAND

DETROIT

**NEW YORK** 

PITTSBURGH

ROCHESTER

Worcester, Mass., U. S. A.

AGENTS

Hendrie & Bolthoff F. E. Satterlee Company

Smith-Booth-Usher Co.

Herberts-Moore Machinery Co. San Francisco

F. F. Barber Machinery Co.

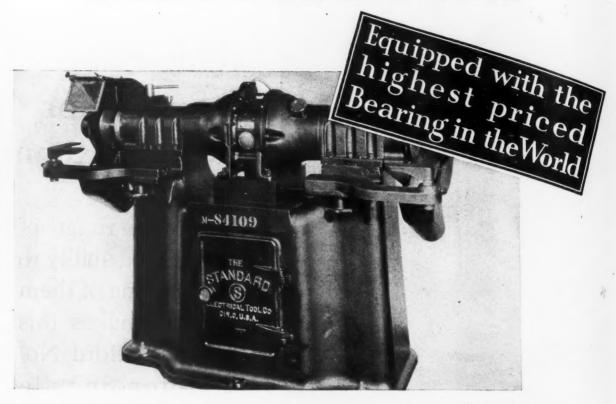
Denver

Minneapolis Los Angeles

Toronto

### LELAND-GIFFORD

#### THE STANDARD ELECTRICAL TOOL CO.



#### ELECTRIC MOTOR OR MACHINE TOOL— 5KF BEARINGS MAKE BOTH BETTER

WO jobs in one is the work cut out for BCF Ball Bearings on the Standard Heavy Duty Grinder. They must maintain the highest efficiency of the electric motor plus that of the machine tool. How well they meet these dual requirements is attested by the continued use of BCF by Standard for years... without consideration of price. It is a consistent policy of giving their customers equipment with quality bearings.

And SESF Ball Bearings do have a vital

part to play in the performance of Standard products. They insure smooth and easy running tools. Inspection after years of operation discloses no wear... and adjustments are never required. Naturally such precision means longer life of the equipment and lower upkeep. Close tolerances are maintained, destructive vibration and motor troubles eliminated. Yes, all things considered, Seep are certainly the lowest in cost per bearing hour... and that's the only basis on which to buy bearings.

5KF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

EQUIPPED WITH THE HIGHEST PRICED BEARING IN THE WORLD

CVIeans just this

Ball and Roller Bearings

That the manufacturers whose product is illustrated above preferred to pay more for their bearings and less for servicing or replacing them. They preferred to pay a higher price in the beginning than many times this higher price in the end. And, finally, they preferred to economize by using SSF bearings because they are made to do their job, not to fit a price list.

4-MACHINERY, August, 1930



have Selective Multiple Cam Feeds

Just a twist of the wrist to change the feed.

This unique feeding motion which is actuated by a series of cams-not by an eccentric and ratchetgives a smooth, rather than an abrupt movement and enables the entire feed under any conditions to be confined wholly within the return stroke, results not otherwise obtained.

The feed box is no longer on the end of the cross rail, where it encroaches upon the operator's working space, but is transferred to the side of the column.

This is just one of the many exclusive features on the Cincinnati that makes it the fastest, smoothest, and the easiest shaper to operate. Our general shaper catalog describes them all in detail-send for it.

THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO.

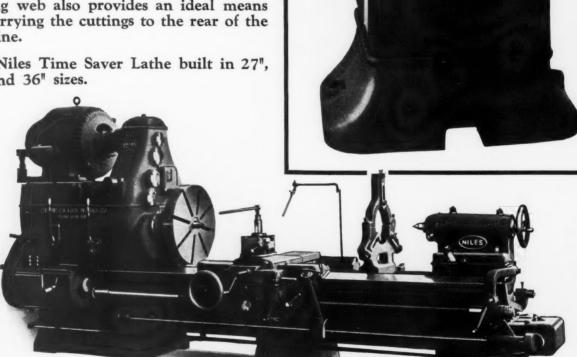
Cincinnati 7 Shapers

#### STRENGTH begins with the . FOUNDATION of the

#### NILES Time Saver LAT

THE BED of the Niles Time Saver Lathe is designed to offer the most effective resistance to the stresses induced by heavy cuts. Note how the bed ways are tied together by the sloping web and a series of cross ties. This sloping web also provides an ideal means for carrying the cuttings to the rear of the machine.

The Niles Time Saver Lathe built in 27". 30" and 36" sizes.



#### The Niles Tool Works Company, Hamilton, Ohio

Division General Machinery Corporation of Delaware

SALES OFFICES

NEW YORK 454 New York Central Bldg.

**PITTSBURGH** 1723 Grant Bldg.

DETROIT 227 Curtis Bldg.

CHICAGO 1853 Daily News Bldg. FOREIGN DEPT.—Niles Bement Pond Co., 111 Broadway, N. Y.

SELLING AGENTS

BULOTTI MACHINE CO., San Francisco, Cal.

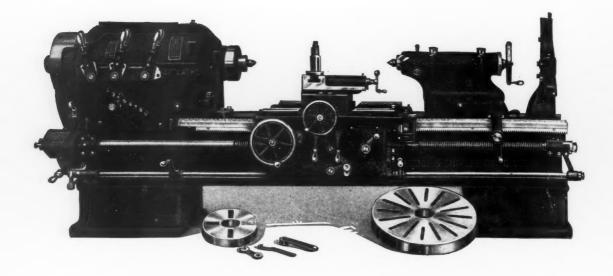
HALLIDIE MACHINE CORP., Wash.

MAIR MACHINE CORP., Houston, Dallas, Texas

PRATT and WHITNEY CO., Birmingham, Ala.

PRATT and WHITNEY CO., Los Angeles, Cal.

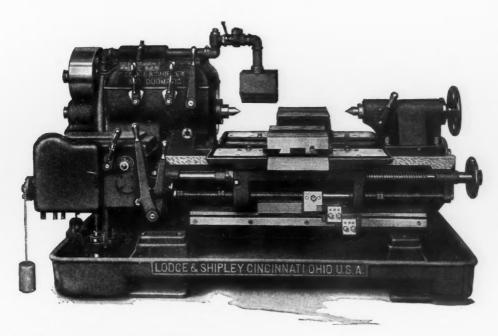




#### THE ENGINE LATHE

Headstock: Twelve speeds, any of which can be selected instantly; accurately cut alloy steel spur gears; hardened steel shafts mounted on ball bearings. Spindle: Double nosed; one-piece hammered steel forging turned and ground to size; white metal spindle bearings. Carriage: Long length; short bridge; supplementary right-angled bearing on horizontal and vertical walls of bed. Compound Rest: Square base eliminating overhang; anvillike metal-to-metal support from cutting tool to bed. Apron: Double wall box-like construction; front and rear bearings for studs; positive interlock preventing simultaneous engagement of threads and feeds; lever control for feeds.

# LODGE AND Quality Lathes First -



#### THE DUOMATIC

The Duomatic provides the means to use multiple tooling to the limit of its possibilities. It is a completely automatic lathe except for loading and starting and is particularly adapted to the needs of the plant utilizing special purpose equipment. There are two complete carriages with tool slides each equipped with independent control so they can be used simultaneously on the same operation or on different operations. This arrangement makes the Duomatic readily adaptable to a wide variety of work. It is automatic equipment brought to its highest, most up-to-date perfection.

Multiple
Tooling
at its Best!

# SHIPLEY

THE LODGE & SHIPLEY MACHINE TOOL CO. CINCINNATI, OHIO

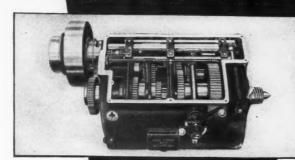
Last — Always!

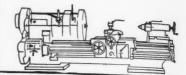
# SALIENT FEATURES OF LE BLOND HEAVY DUTY LATHES

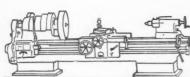


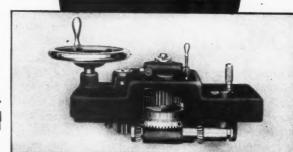
#### **HEADSTOCK**

Only two levers to obtain all spindle speeds—sliding gear drive without jaw or friction clutches—shortsplined shafts rigidly supported—all gears revolve with the shafts on which they are mounted.







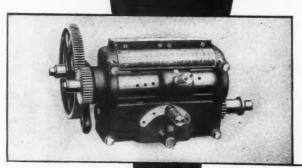


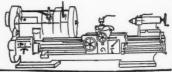
#### **APRON**

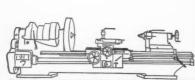
Single positive jaw clutch to engage both feeds—no frictions—one piece box type unit—all shafts supported on both ends—fewer parts—easy to operate.

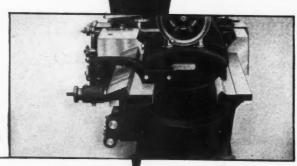
#### FEED BOX

Easy to read—easy to shift—compact, husky, unit construction—gears of steel with special form teeth for easy engagement—index plate conveniently located for quick visibility.









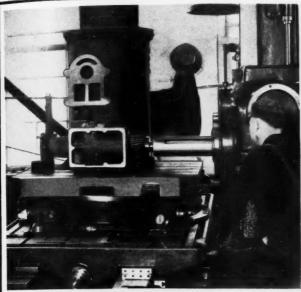
#### **BED-CARRIAGE**

In the design and construction of this heavy duty lathe, particular attention has been paid to the bed and carriage. Due to a unique design the carriage cannot climb on heavy cuts—accurate alignment is assured for years to come and continued accuracy of work is certain.

#### LEBILOND

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI, OHIO
Builders of Lathes—Cutter Grinders—Milling Machines—
Aircraft Engines—Electrical Tools

Write for catalog or let us send a representative to tell you all about these and many other valuable features.

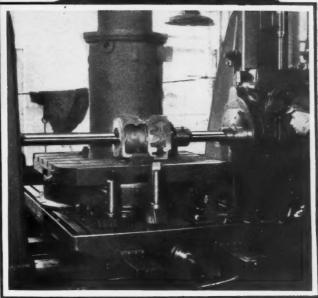


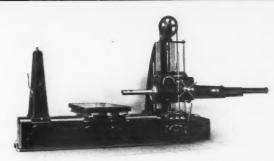
# THE WAY IS OPEN TO MAKE

TREMENDOUS SAVINGS

Accuracy, flexibility and economy—the three requirements of the ideal machine tool—are the basic principles of the G & L Method. Among the many concerns that are profiting by this modern method of boring, drilling and milling on one machine, is The Titusville Iron Works Co., Titusville, Pa., manufacturer of oil field machinery. The photos show the G & L No. 45 High Power Precision Boring, Drilling and Milling machine, with dial indicator equipped table, boring and milling several sides of a gas engine cylinder.

Accuracy is assured. Flexibility permits a large variety of boring, drilling, milling, tapping and facing operations on one piece; also a number of different pieces can be machined without the extra handling and costly setting-up time required when separate machines are used. By performing all machining operations on *one* machine the G & L Method cuts floor to floor time and tooling investment to the minimum.

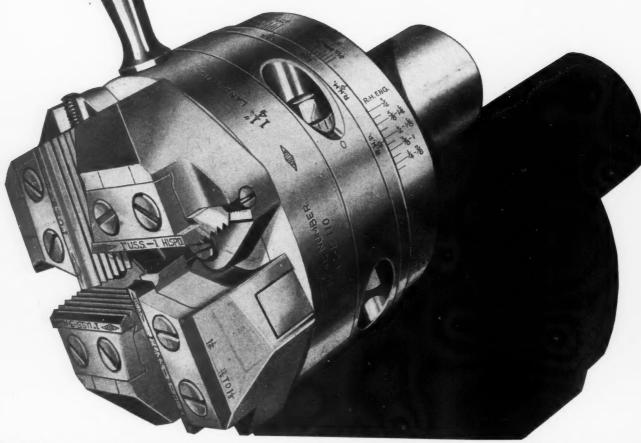




Specialists in Horizontal Boring, Drilling and Milling

GIDDINGS & LEWIS MACHINE TOOL CO. FOND DULAC, WISCONSIN ESTABLISHED—1859
The STABLISHED—1859
The Control of Boring Drilling and Milling and Millin

# in the manufacture of MACHINE TOOLS LAND





Accurately cut threads—essential in every mechanical assembly-are of primary importance in machine tool construction.

And LANDMATIC Heads on the turret lathes cut important threads on parts for many of our best known and most highly rated machine tools. The machine tool manufacturer knows the importance of accuracy and durability in his product; he insists upon it in his equipment. LANDMATIC Heads with Patented Landis Chasers are production tools designed for use on production machines. They are opened automatically by stopping the forward movement of the turret slide and can be closed by hand or a mechanical attachment. The free cutting action of Landis Chasers and the natural clearance which reduces friction at the cutting edge to a minimum, make possible the use of high threading

Machine Tool builders—or other turret lathe and screw machine users-send for details of LANDMATIC Die Heads; their production possibilities, their operating efficiency, their durability will interest you.

#### LANDIS COMPLETE THREADING EQUIPMENT

LANDMATIC Heads for Turret Lathes and Screw Machines LANDEX Heads for Automatic Screw Machines LANCO Heads for Automatic, Semi-Automatic and Hand Operated Threading Machines Threading Machines

Automatic Forming and Threading
Machines

Pipe Threading and Cutting Ma-chines

Stationary Pipe Die Heads Pipe and Nipple Threading Ma-chines Roller Pipe Cutters

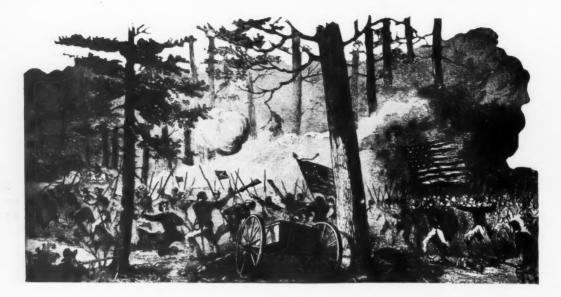
Chaser Fipe Cutters Chaser Grinders Standard Rotary Die Heads Victor Collapsible and Adjustable Taps

#### LANDIS MACHINE COMPANY, INC.

WAYNESBORO, PA.

Detroit Office: 5928 Second Blvd. Cleveland Office: 504-505 Marshall Bldg.

MACHINERY, August, 1930—13



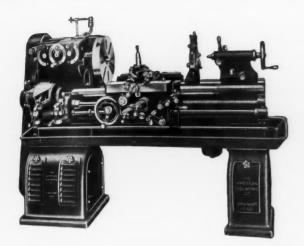
### LEADER



General Grant was christened Hiram Ulysses Grant, but through an error of the congressman who recommended him for West Point, he received the name Ulysses S. Grant. A trick of fate which, in giving him the abbreviation of his country's name for initials, undoubtedly helped his deserved popularity.



AMER



## SHIP

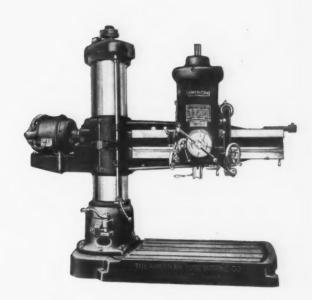
The ability to see all sides of a situation—to place himself in his opponent's position—this, coupled with a will of iron, made General U.S. Grant the outstanding commander of the Federal forces in the Civil War, and later aided him in attaining the Presidency. He was one of that group of brilliant leaders that ever has been America's pride and strength in her crisis.

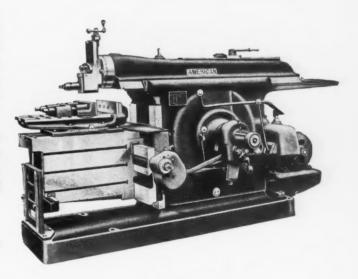
In industry, leadership is recognized and awarded the distinction it deserves. A product which has reached leadership in its field, through quality and service, has arrived at the most critical period of its success: The maintenance of the good name it has earned.

American Lathes, Radials, Shapers do not rest on their laurels! Each year sees improvements that are designed to further advance the ability of these machines to produce accurately and economically.

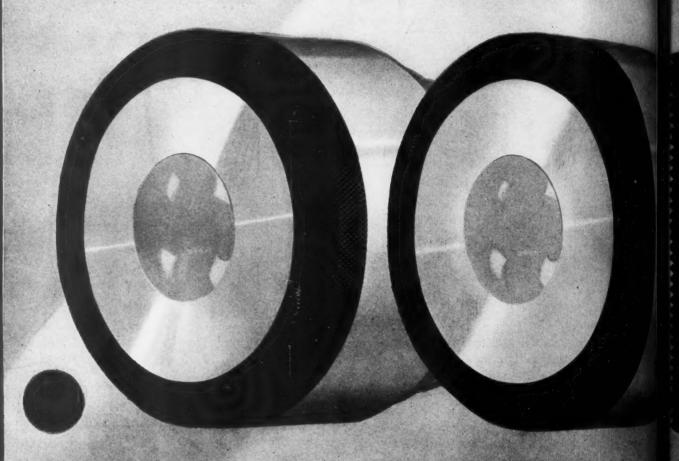
The American Tool Works Co.
Cincinnati, U. S. A.

# LATHES RADIALS SHAPERS





## ICAN



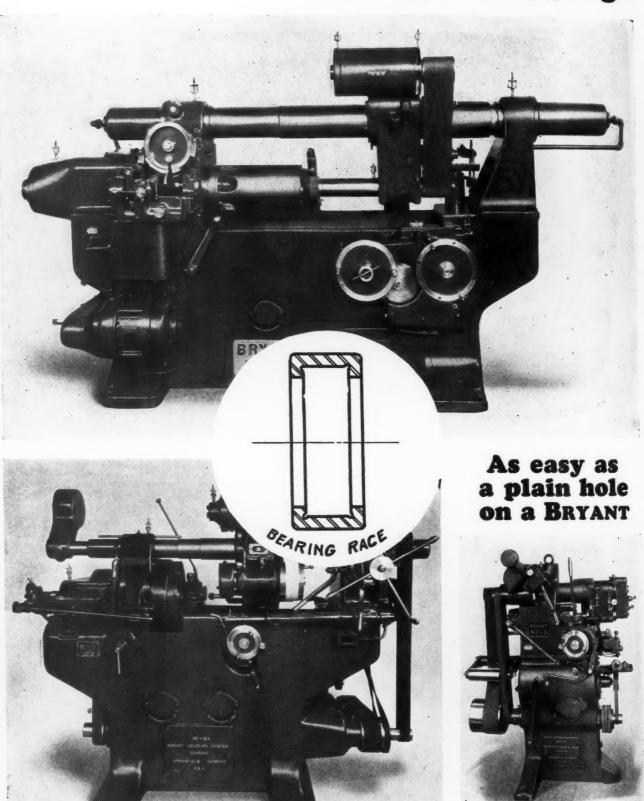
JEL JONES & LAMSON

GUA: LEAD JONES & INGENTION

# Perinch

# RANTED ACCURACY ACCURACY AMSON MACHINE CO. VERMONT

## Can You Grind This Hole Without Lapping?



BRYANT CHUCKING GRINDER CO. SPRINGFIELD, VERMONT
Makers of Single Slide Internal Grinders

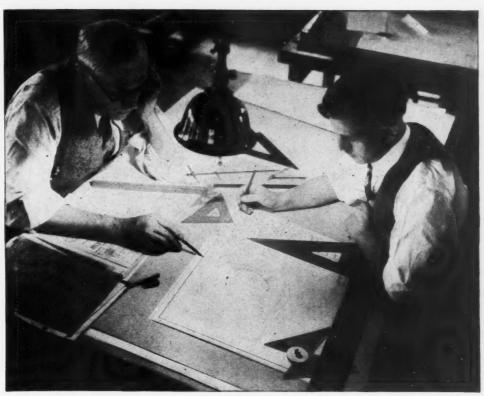
## You can

## drive a nail with a stone

IF IT CAN BE MILLED.



There is a K&T solution for every milling job. You will find it a practical solution—one which will reflect the experience of the skilled engineer and one in which and one in which you may safely place your confidence.



No mechanical principle has ever been applied successfully unless presented in a form which brought out its good qualities to the best advantage. . . . You can drive a nail with a stone but much more easily and effectively with a carpenter's hammer.

Efficient design is the most essential requirement of a good milling machine. All of the tasks which a milling machine may be called upon to do must be studied carefully, for design determines the very life of the machine, its accuracy and dependability, its ability to meet changing production demands and to successfully cope with the wide range of work in the milling field.

Thirty-two years experience have shown Kearney & Trecker that there are certain fundamental principles of design which are vital factors in the successful operation of a milling machine. That they have profited by this experience is evidenced by the many features of milling machine design, developed by Kearney & Trecker, which are now accepted as standards of comparison by hundreds of users. The All-Geared Spindle Drive, the Double Overam, Front Dial Feed Control, Automatic Flooded Lubrication, and Power Rapid Traverse in all directions, are outstanding examples

In Milwaukee Milling Machines you have these advantages and many others which can be applied profitably to your milling problems.

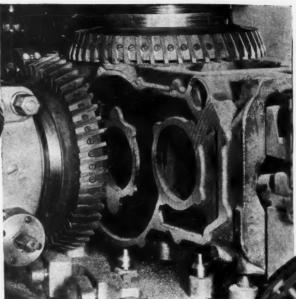
#### KEARNEY & TRECKER MILWAUKEE MILLING MACHINES

MILL IT FASTER

MILWAUKEE



Finish milling a tractor transmission case at 10-inch feed. Two 18-inch Type Q Cutters (above), took roughing cut while two 18-inch Type R cutters (right), took finishing passes as shown.



Plan NOW for Cutter Economy

For heavy cuts in cast iron and steel the Ingersoll Type S cutter is an ideal tool. It is illustrated above.

#### Bulletins:

No. 46 "Ingersoll Equipment for Railroad Shops."

No. 47 "Ingersoll Milling Machines."

No. 48 "Ingersoll Cutter Grinder."

No. 49 "Ingersoll Milling Cutters."

Consistent performance . . . continuous reliability . . . lower maintenance . . . longer life through ready means for setting out teeth until more than half their original length is used—these are results to be had by standardizing on Ingersoll Inserted Tooth Cutters.

Face Milling cutters for cast iron, steel and aluminum . . . heavy helical cutters for slabbing alloy steel . . . solid shank cutters for contour milling . . . others designed for specific operations . . . Ingersolls cover the field whether the work is general milling, very heavy roughing or high degree finishing at maximum feeds.

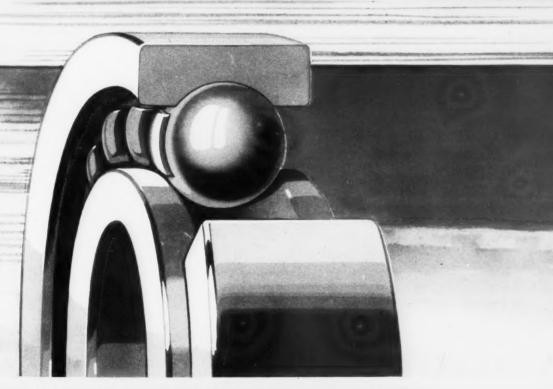
Ingersoll cutters are made right and priced right. They quickly pay for themselves and return handsome dividends through savings effected.

An Ingersoll expert will be glad to study your cutter problems without obligating you.

THE INGERSOLL

MILLING MACHINE
COMPANY» ROCK FORD,



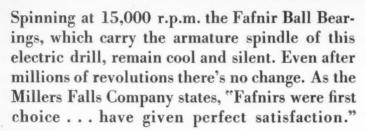


SPEED IS SAFELY MAINTAINED WITH FRICTION-FREE FAFNIR BALL BEARINGS

FAFNIR BALL BEARINGS

## Protection at

## is positive on FAFNIRS



Fafnirs provide complete bearing protection. The maximum number of large diameter balls whirl friction-free in deep races. Shocks, thrusts and heavy loads are readily absorbed. Wear is banished, adjustment never needed. An occasional lubrication is the only attention required by Fafnir Ball Bearings.

Wherever loads are carried at high speeds, manufacturers are assuring lasting alignment with friction-free Fafnirs.

THE FAFNIR BEARING CO., NEW BRITAIN, CONN.

New York . . . Chicago . . . Milwaukee . . . Detroit

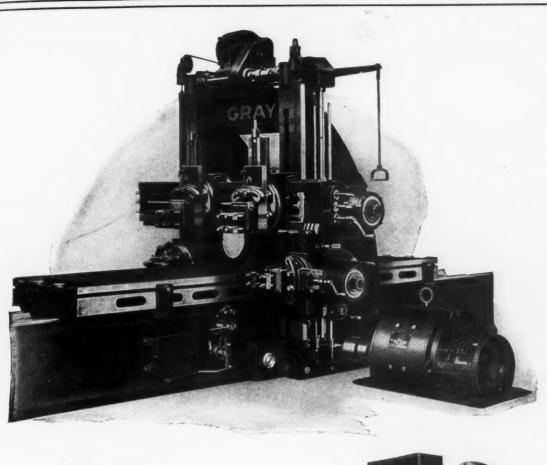
Newark . . . . . Cleveland . . . . . . Philadelphia











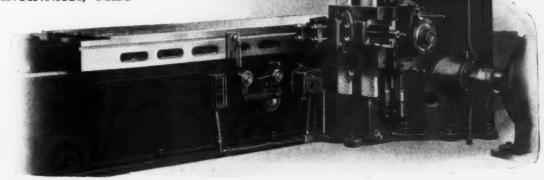
## GRAY Maximum Service PLANERS

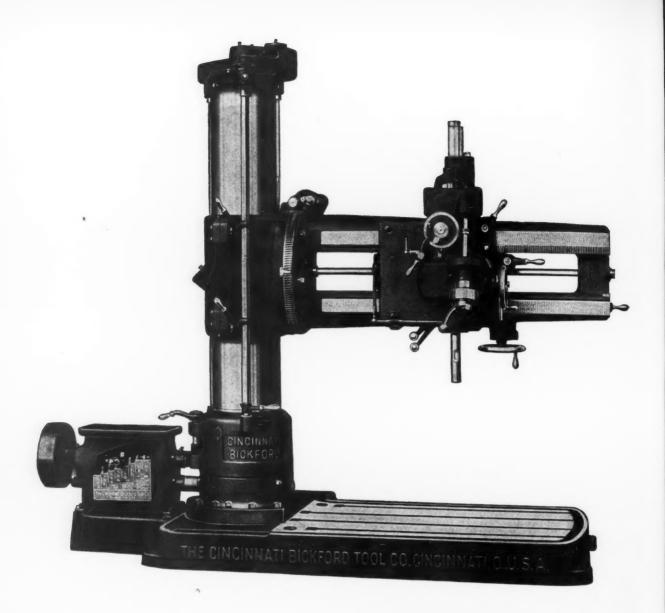
Open-Side and Double-Housing. Many sizes, but only one quality.

Send for Our Catalog

THE G. A. GRAY CO.

CINCINNATI, OHIO





# CINCINNATI BICKFORD 5' & 6' Full Universal Radial Drills

The Cincinnati Bickford Universal Radial possesses the rigidity, power and durability of a plain radial owing to its patented arm construction which offers equal resistance against deflection. Its design permits the back gears and reversing mechanism to occupy the same relative position on the head and provides ample space for these parts. No machine fitted with an arm enclosed at the back permits of such strong construction, as the space circumscribed by connecting the upper and lower guide-ways is too meagre.

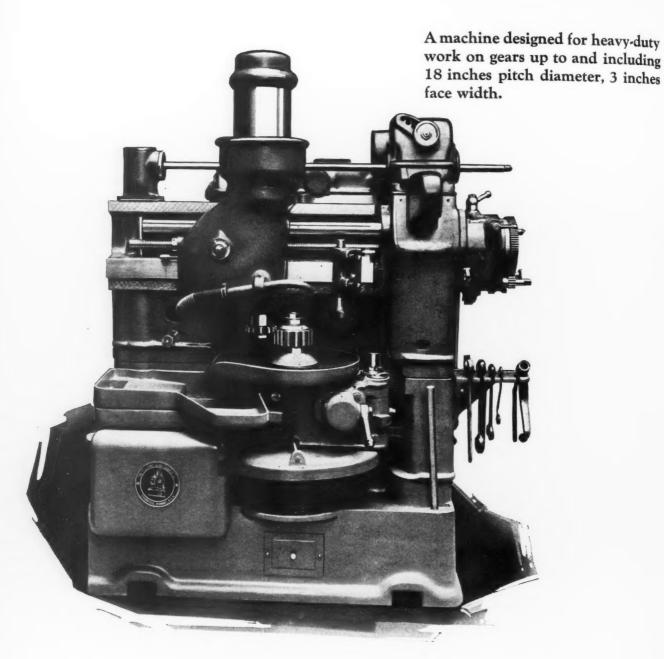
Our arm not only eliminates all space limitation but also affords greater accessibility to the saddle mechanism. The arm is graduated to 90° on either side of the vertical and is rotated by a worm mounted on ball bearings. The head may be swiveled to any angle by means of a worm and gear and it is graduated to 90° on both sides of the perpendicular. Consequently, drilling may be done at any angle radiating from the center of a sphere which makes this machine indispensable for many classes of work.

# Drills at Any Angle To Reduce Difficult Set-Ups

The Cincinnati Bickford Full Universal Radial Drill presents a new slant on drilling, in that it can drill holes at any angle. This important feature eliminates many of the setups otherwise necessary in drilling the difficult castings encountered in building special machines and tools, and in repair work. It presents a new slant on shop economy, for the installation of a Cincinnati Bickford Full Universal Radial Drill will materially decrease the cost of drilling those jobs which ought to be drilled horizontally, but for which the purchase of a horizontal boring mill is not justified. In many plants, Universal Radial Drills are doing the work of two machines. Have you considered the possibility of such a machine for your work?



## 6A-Type Gear Shaper



#### THE FELLOWS GEAR SHAPER

Head Office and Works,

Branch Office: 1149 Book

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HIS.

#### 

## with 3-Inch Stroke Saddle

The 6A-type Gear Shaper can now be obtained with what is known as a 3-inch stroke saddle, instead of 5 inches, which is the stroke capacity of the regular machine.

This new saddle considerably increases the productive capacity of the machine, because it permits the use of heavier feeds and higher reciprocating speeds.

One of these saddles has been dismantled in the view below. Note the cutter spindle made from a one-piece forging with guide attached. Also note that spindle is made hollow to reduce weight, and counterbalance spring is enclosed in the spindle.

Another feature worthy of notice is the drive. The spindle is provided with cylindrical rack teeth and meshing with this "rack" is an "enveloping" pinion provided with two integral keys.

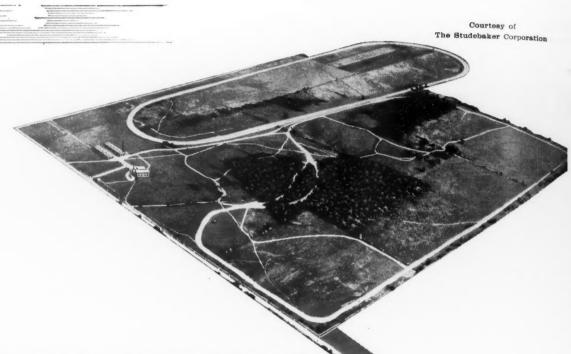


### COMPANY, Springfield, Vermont

**78 River Street** 

Building, Detroit, Mich.

KS,



#### PROVING PERFORMANCE

Bumping over chuck-holed roads—climbing almost insurmountable inclines—splashing through mud and water—jamming on brakes at "80 per,,—that's the proving ground—the outdoor research laboratory of the automotive industry. Here performance is definitely proven.

To insure built-in accuracy, stamina and operating ease, definite tests are essential to all mechanical creations.

Every Cincinnati Centertype and Centerless Grinder by performance tests must tell its own story of operating efficiency while being manufactured and run-off in our plant. The cost reducing and profit earning ability of each machine is definitely established for the user.

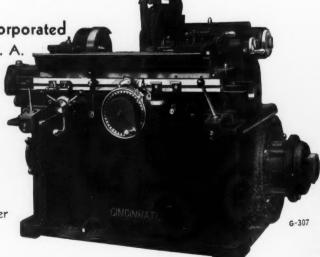
Installed in your shop, Cincinnati Grinders will continue to prove performance by lowering your operating costs—increasing production—improving accuracy—earning more profit

Cincinnati Grinders Incorporated

Cincinnati, Ohio, U.S. A.



Cincinnati Self-Contained Saddle Type Grinder





Every milling machine operator appreciates complete *independent directional* control of all power feed movements on the new No. 3 and No. 4 Cincinnati Millers. In his normal operating position at the front or *rear* the operator moves the independent levers left or right—in or out—up or down, and the table, saddle and knee, travel in the direction the lever is shifted.

On boring or face milling jobs he steps to the rear of the machine. With the cutters and work in full view he quickly changes feeds and speeds

by power, makes accurate hand adjustments, and controls all power feeds.

Actual time studies have proven that many jobs are being handled in 20 to 30% less time as the result of these profit-earning features. And the operator works to closer limits of accuracy with less fatigue.

Toolroom and manufacturing shops alike, demand milling machines with a new accuracy and a new convenience. Where else but on the new No. 3 and No. 4 Cincinnati Millers can you find this combination.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.



CHANGING FEEDS AND SPEEDS

BY POWER





#### No. 30 Rigidmil Increases Production on Aircraft Motor Crankcases

Releases 90% of Operator's Time for Other Productive Work

by a SUNDSTRAND SALES ENGINEER

Confidence in the Sundstrand Machine Tool Company, inspired by the high quality of the engineering service rendered in connection with Sundstrand machines previously installed, brought us an inquiry for equipment to mill the faces of the airplane motor crankcase shown in Fig. 1.

Accuracy in indexing this piece is fundamental; angular relation of the milled surfaces, distance from center and excellence of

finish are all held to high standards. An automatic machine was desired to increase production and reduce cost.

The No. 30 Rigidmil with hydraulic feeds and automatic indexing hydraulic fixture, shown in Fig. 2, meets the requirements outlined above. The fixture accommodates two sizes of crankcases, both having nine faces. It is designed and built to hold absolutely the tolerances on indexing. It is hydraulically

> actuated and indexes automatically from face to face as milling is completed, stopping after the last face is finished. Accurate locating means and a quick acting clamp are provided. Another view of the fixture is shown in Fig. 3.

> The Rigidmil spindle running in selected taper roller bearings; the powerful, smooth drive, the flywheel on the spindle and the exceptional rigidity of the whole machine all combine to provide the high production and fine finish required. Micrometer adjustment of the spindle-quill facilitates the establishment and maintenance of accurate dimensions from the center of the crankcase.

> The former method of milling these crankcases required 100%

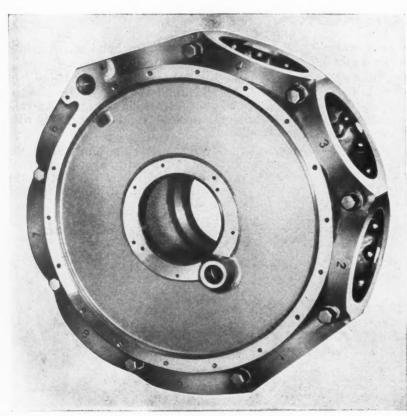


Fig. 1. The nine-sided crankcase milled.

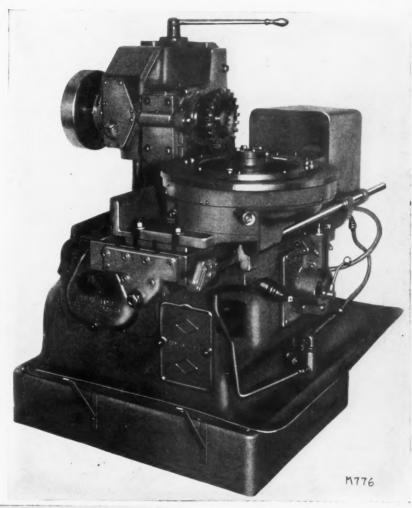
## PRODUCTION SUNDSTRAND FILES

Lathes Milling Machines Centering Machines Balancing Tools

August, 1930

of an operator's time, the No. 30 Rigidmil on this job takes only 10%—the remaining 90% can be devoted to other productive work. This is due to the automatic operation cycle in which the work rapidly approaches the cutter, slows to feeding rate for milling, quick returns and indexes. This repeats automatically until the nine faces have been milled, then all movement of the work ceases. Just before each quick return the cutter recedes from the work automatically thus preserving the fine finish of the freshly milled surface.

Here is accurate work, high production, low cost—in short Sundstrand Engineered production. This service is available to all manufacturers interested in better milling and turning through the use of Rigidmils and Stub Lathes.



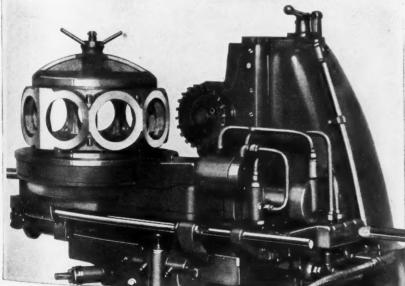


Fig. 2. Above, No. 30 Rigidmil with feeds and fixture operated hydraulically.

Fig. 3. At left, close-up of fixture, with finished work piece in place.

## NOW is the Time-

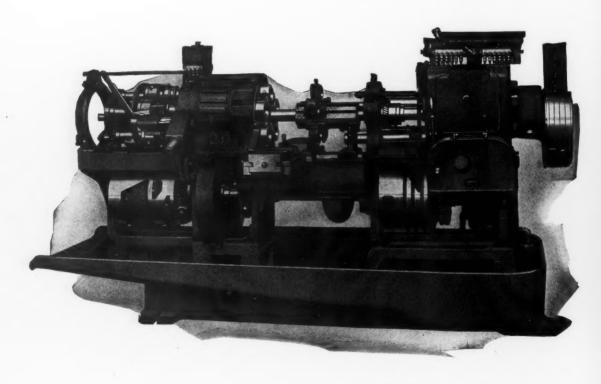
With competition keener than ever before-

With prices shaved down to the last fraction-

With insistent demands for faster, more accurate production—

NOW is the Time to install equipment which will put you one jump ahead. And the new Acme 5 Spindle Automatics will do it.





Scientific purchasing is based on known performance costs.

Unless you know exactly what it costs to ream a hole with various makes of reamers in your plant, you may be signing away dollars that could be saved.

Take the case of a large electric truck manufacturer. Much difficulty had been experienced in finding a satisfactory reamer for a particularly hard job. Finally, the plant superintendent decided to get the true facts by means of a "cost-per-hole" test. Spirex High Speed Machine Taper Pin Reamers were matched against regular taper pin reamers. When the final results were computed, the plant superintendent found that Spirex averaged 300 holes per reamer to 23 holes for the straight fluted reamer. Savings through the use of Spirex amounted to \$2.72 per 100 holes. Spirex reamers performed the same work for \$0.38 that straight fluted reamers had formerly performed for \$1.00.

There no longer need be any uncertainty or risk in the purchase of reamers. Our special test makes it possible to conduct a "cost-per-hole" test in your own plant comparing any reamer, hole for hole with Spirex Reamers.

We can quote you scores of cases where economies amounting to hundreds, even thousands of dollars have been brought to light by the "costper-hole" test.

Certainly it's worth your while to get the details and the necessary forms. Do it now. No obligation of any kind is involved. Just send the coupon below.

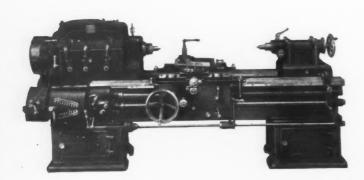
- Spirex Machine Taper Pin Reamers are revolutionizing pin hole reaming. Due to special Spirex construction, chips do not tend to
- pack in the flutes. Costly breakage is practically eliminated. In
- one cost-per-hole test Spirex produced 88,000 holes without a break.



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# A

"Built for Endurance"



## POWERFUL AS THE SEA

"The stern and rock-bound coasts" of high pressure production have yet to make a Lehmann lower its colors; and they're up against the toughest turning work every day.

There's power in these exceptional machines—more than enough to handle anything within range that comes along. *Power*—teamed with a flashing speed that makes profits grow where they never grew before.

Users like their Lehmanns; like their dependability, their handling ease, their economy, their unusual precision. Let us give you "10 Reasons Why" a Lehmann belongs on your production line. Or send in a job for an estimate.

#### LEHMANN MACHINE CO.

3571 Chouteau Avenue ST. LOUIS, MO.

## The IFE AND

An EXCEPTIONAL Engine Lathe





NEW BEDFORD, MASS., U.S.A.

#### THE JOHNSON FRICTION CLUTCH

THE

SUPER-



Single Clutch Broken Away

**JOHNSON** 

FRICTION CLUTCH

Will Give

## SUPER CLUTCH

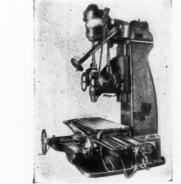


Single Clutch Exterior

### **SERVICE**

On Your Particular Type of Machine

As it does on Pratt & Whitney's Model "B" Precision Lathes and on their Jig Borers (Nos. 3 & 3A)



JIG BORER

WIRE, PHONE or WRITE FOR CATALOG "A-8"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



#### Samuel Slater Flees England in Disguise

To maintain English preeminence, Parliament prohibited the colonists from building furnaces, mills and forges and frowned upon any manufacturing enterprise. The Revolution made this act futile, but Parliament, still eager to retain superiority, enacted a law prohibiting skilled English mechanics to leave her shores. Samuel Slater, anxious to try his lot in a new country, left in disguise. He later became the founder of the American Cotton Industry which gave added impetus to machine tool development.



#### TO-DAY There's No Embargo On Genius

EVER, in the history of industry, has there been such keen rivalry for market domination...
... yet, there is no embargo on genius.

Developments are made in machine tools. There are methods to speed production, increase accuracy and lower costs.

... and they are offered in the form of Consolidated Machine Tools. Every industry can avail itself of the productive advantages of Consolidated.

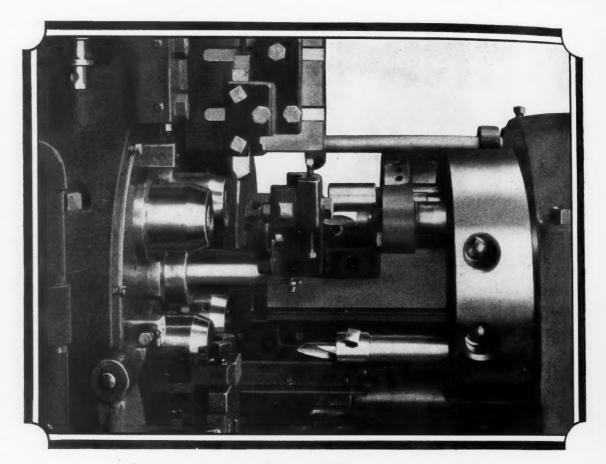
CONSOLIDATED MACHINE TOOL CORPORATION OF AMERICA

Rochester, New York



NEWTON Heavy Duty Single Station Type Continuous Milling Machine with roughing and finishing spindles.

CONSOLIDATED



## Cleveland Offers a New SQUARE TURRET ATTACHMENT

URTHER simplification of tooling, with increase of possible cuts and definite savings result from the new Square Turret Attachment, applicable to all Model M, Multiple Spindle Cleveland Automatics.

Offering four new centrally located positions for turning tools, its outstanding advantage is in avoiding complicated tool combinations and making possible the use of standard tools in such set-ups as would otherwise require special tool combinations to accomplish the same result.

The cylindrical tool turret of large diameter, supported in its wide bearing, carries four

positions for shank tools. The square turret, mounted on the main turret, provides four extra tool positions, which are entirely independent of tools held in the main turrent.

Cross slides and double top slide offer four more possible tool positions, assuring Cleveland users the most complete and readily adaptable arrangement of standard tools of any machine now offered to the metal industries.

Thirty years ago, Cleveland provided a similar attachment, with multiple cutters for its Model A, Single Spindle Machines, which was mounted on the face of the tool turret. In offering this improved Square Turret Attachment, Cleveland

follows its established custom of giving to its many patrons all the benefits to be derived from improved tooling methods.



#### THE CLEVELAND AUTOMATIC MACHINE COMPANY

2269 Ashland Road, Cleveland, Ohio, U.S.A.

**NEW YORK** 95 Liberty Street CHICAGO 565 W. Washington Boulevard DETROIT

HANNIFIN AIR PRESSURE REGULATING VALVES





For the Utmost in Efficient and Economical Operation



Model V Air Control Valve Disc Type

A hand control unit of simple, rugged and efficient design. Made of the finest steel and bronze throughout, in four sizes. The elimination of packing prevents leakage and requires no maintenance.

#### Hannifin Product

Standard Air Operated Chuckers
Special Air Operated Churchers
Air Operated Churchers
Air Operated Expands Mandrels
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Air Operated Press
Air Operated Press
Stationary Outper Air Cylinders
Stationary Outper Acting Air Cylinders
Air Control Aires
Air Control Aires
Air Operated Riveting Presses
Air Clutch Countershafts.



Model FS Air Control Valve Disc Type

A spring return foot control model that offers the same range of features and superiorities of construction as the Model V. Simple, rugged semi-steel construction and unusually accurate workmanship assure efficient, trouble-free operation indefinitely. Three sizes.



Model F Air Control Valve Rotary Disc Type

Heavy duty foot control type, especially adapted to operating Arbor Presses, Riveting Presses and larger non-rotating cylinders. Furnished in one size, with a wide choice of connections.

The Hannifin Air Pressure Regulating Valve is needed for efficient and economical operation of air-operated arbor presses, air chucks, oil and gas furnaces, etc.

Air pressure can be instantly adjusted to the requirements of any operation to eliminate possible distortion of work as well as reduce air consumption. As two operations seldom require the same pressure, Hannifin Air Pressure Regulating Valves on all machines enable them to be operated independently at their most economical working pressures.

The Hannifin Regulating Valve is unlike all others. Instead of a diaphragm it has a piston. This construction results in a full size orifice permitting a full, unrestricted flow of air.

Ask us for catalog illustrating Hannifin Air-operated Production Equipment.

#### HANNIFIN MANUFACTURING CO.

621-631 S. Kolmar Ave., Chicago, Ill.



Krueger Multiple Drilling Equipment is designed and built to meet specific drilling, reaming, and tapping requirements.



The Wayne Division produces dies, jigs, fixtures, and special equipment. All products are made to specification.



The Wolverine Division is devoted exclusively to the production of special automatic screw machine products.



The Continental Division offers a complete line of counterbores, ground taps, milling cutters, and special tools.

The Addition of the Products and Facilities of the Following Companies Now Makes

## **EX-CELL-O**

A Logical Source for ALL Precision

Machine Tool Products

#### H. R. KRUEGER & CO.

Multiple Drilling Equipment

#### WAYNE TOOL CO.

Dies, Jigs, Fixtures

#### WOLVERINE SCREW CO.

Special Automatic Screw Machine Products

#### **CONTINENTAL TOOL WORKS**

Counterbores, Ground Taps, Milling Cutters

These four companies, each a specialist in its particular field, bring to Ex-Cell-O not only a group of distinguished products, but years of experience and a reputation for quality, dependability, and value which is completely in keeping with Ex-Cell-O tradition.

XLO-XLO

1200 OAKMAN BLVD.

Ex-CELL-O

Aircraft XLD & Tool
Corporation

XLO-XLO

DETROIT, MICHIGAN

38-Machinery, August, 1930

ACCURACY IN

IS EVEN MORE

THAN ACCURACY

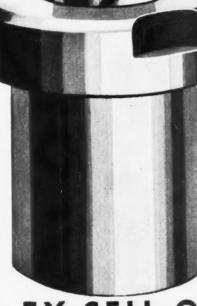
THE BUSHING

IMPORTANT

IN THE DRILL

Drill jig bushing limits should be just as close as, or even closer than, the limits held in the boring of the jig itself. Only in this way can the accuracy of the jig be maintained! Just such a bushing is required as any which you might select from Ex-Cell-O's stock of more than 200,000!

There is an accurately ground, TOOL STEEL Ex-Cell-O Drill Jig Bushing in a size, length, and type to meet every drilling requirement.



EX-CELL-O DRILL JIG BUSHINGS The Ex-Cell-O Drill Jig Bushing catalog includes complete data sheets and price list. A copy will be mailed free of charge upon request.

Ex-Cell-O also manufactures the celebrated Ex-Cell-O Internal Grinding Spindle, Surface Grinding Spindles, Precision Aircraft Engine Parts, and Diesel Engine Fuel Pump Parts.

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1200 OAKMAN BOULEVARD DETROIT

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#### STEPTOE SHAPERS

Timken Tapered Roller Bearings Make Power Flow Smoothly

Ample power and smooth operation are valuable features of Steptoe Shaper design—while adjustment of ram stroke made while machine is in motion and other convenient features of control insure efficient service.



## Three Roads to Production Profits

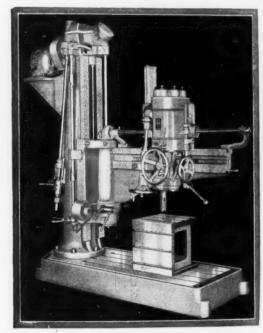
Three "Western"—all Timken equipped—Machines built to give the best kind of service on three important classes of work.

## The GARVIN 2X AUTOMATIC TAPPERS

Timken Tapered Roller Bearings and Timken Bearing Equipped Four Change Speed Box

Speed and smooth, vibrationless operation obtained through Garvin design and construction insure profitable production on threaded holes with minimum tap breakage.

Equipped with hardened chrome nickel gears in the new selective type speed box and other valuable special construction features.



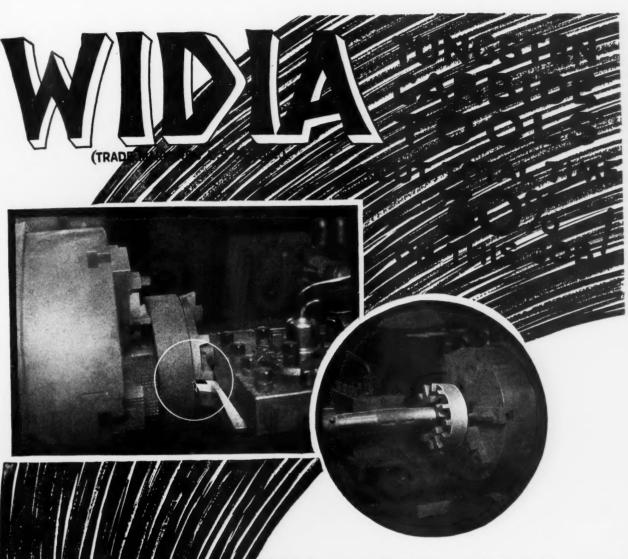
#### WESTERN Low Hung Drive RADIAL DRILLS

Powerful, Smooth Running, Fast— Equipped with Timken Roller Bearings

With the drive at the business end of the spindle (eliminating torsional strain), with highest quality bearings to insure permanently smooth operation, Western Radials offer drilling power, production capacity, accuracy that insures efficient service and a profitable installation. Send for details of the Western Line.

WESTERN MACHINE TOOL WORKS, HOLLAND, MICH. Cable Address "Western" Holland

40-MACHINERY, August, 1930



WIDIA Tungsten Carbide Tools have again proved their phenomenal cutting qualities in another of the country's leading industrial plants. This job, a cast iron ring of 9 inches diameter with twelve interruptions, is faced, chamfered and turned with one WIDIA tool. The 12 interruptions give 1200 blows per minute on the cutting edge of the tool, demonstrating the ability of WIDIA to take an interrupted cut at high speed on a production job.

The following chart shows in detail the actual savings effected over the well-known special alloy tool previously used.

Tool Prev. Used	WIDIA
Speed—O. D 92 F.P.M	236 F.P.M.
Feed	.032"
Av. pieces per grind 11	. 80
Floor to floor time 17 Min	12 Min.
ASK FOR A DEMONSTRATION	ſ.

#### THOMAS PROSSER & SON

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"Cut Costs with WIDIA"

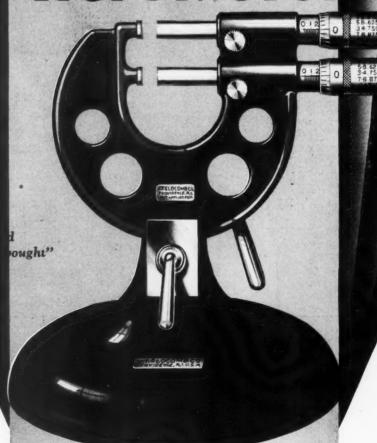
MACHINERY, August, 1930-41

#### for Inspection and Production

THE Slocomb Snap Gauge Micrometer eliminates the necessity for a variety of snap gauges for inspection and production work. The two screws can be set by standards and locked, or, in straight production work, the minimum limit screw can be locked and the other left to revolve freely, permitting the operator to measure work in progress and eliminating loss of time and guesswork. All famous Slocomb features are standard in this tool:— One piece, all tool steel screw with long bearing on its nut, compensating nut, tool steel anvils. Send for details.

J. T. SLOCOMB CO. PROVIDENCE, R. I.

# SNAP GAUGE MICROMETER



"The Micrometer

ALSO MAKERS OF SLOCOMB CENTER DRILLS-COMBINATION DRILL AND COUNTERSINK

42-MACHINERY, August, 1930



**Features** 

Direct motor drive through worm and worm gear reduction, also pick-off gears for speed changes. Clutch controls rotation of spindles. Interchangeable spindle units, Timken Tapered Roller Bearings, oil bath lubrication. Oilgear Feed. Furnished in Horizontal and Vertical arrangements.



Special machines for specialized work are important and necessary manufacturing accessories. But when their functions are confined to a solitary operation, a slight change in the part's design often makes them unavailable for further service.

Rockford Drilling and Boring Machines, while specialized, are easily adaptable to various jobs. That shown is typical. Built for a crankcase boring job, the machine is supplied with the two additional Spindle-Units shown in the illustration, which are easily interchangeable with the Spindle-Units now on machine and capable of entirely different work. Thus changes in design cannot affect the machine's earning capacity. It is permanently installed for consistently profitable work.

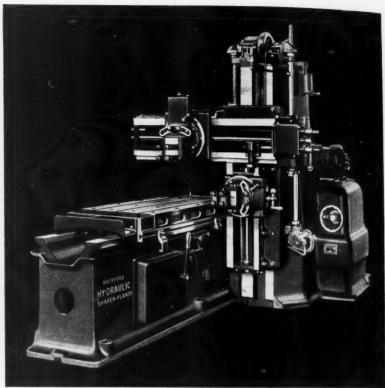
> Let us tell you further about this valuable Rockford feature.

ROCKFORD DRILLING MACHINE CO.

209 Catherine Street, Rockford, Ill.

C K F OMULTIPLE-SPINDLE DRILLING AND BORING MACHINES

# w h y BIG SHOPS



#### USE HY-DRAULIC SHAPER-PLANERS

In big shops, or in any shop where work is machined in large lots, Rockford Hy-Draulic Shaper-Planers are used because—

- The exact speed and feed for maximum production can be adjusted instantly.
- 4 Quick return is quick—three times cutting speed.
- 2 Maximum cutting pressure is reached when the tool enters the metal, and it remains constant throughout the cut.
- **5** Rapid traverses take tools quickly from one surface to the next.
- 3 Table reversals are smooth, quick and shockless.
- 6 Tools run 60% to 80% longer between grinds.



These are the *main* reasons why Rockford Hy-Draulic Shaper-Planers are profitable on mass production. The high accuracy of the machine cuts inspection costs, its efficiency reduces power consumption, its durability and complete lubrication save maintenance expense.

There are many other reasons why Rockford Hy-Draulic Shaper-Planers are a good "buy." Write today for circular containing complete description with specifications and see for yourself.

ROCKFORD MACHINE TOOL CO. 2412 KISHWAUKEE STREET « » ROCKFORD, ILLINOIS

## MICHIGAN









## "MICHIGAN" GEAR SHAPER CUTTERS

The Same As You Do Other Accurate Gear Cutting Tools

#### Products of the Michigan Tool Co.

Hobs (Ground and Unground)
Gear Shaper Cutters
Spline Shaft Hobs
Single Purpose (Involute) Gear Cutters
Milling Cutters (All Types)
Thread Milling Hobs
Formed Tools for Screw
Machine Work
Tungsten Carbide
Cutting Tools

Tool Engineering Service and Complete Catalog on request Ten years ago an insistent demand arose that some independent gear cutter manufacturer enter the field making cutters for the Gear Shaper Machines.

This demand arose because gear manufacturers could not obtain cutters of accuracy comparing with other ground gear cutting tools at reasonable prices.

Our engineers thereupon designed special equipment for grinding this type of cutter, and for checking the same to closer limits than any cutters had heretofore been produced. As a result, Michigan Gear Shaper Cutters at once became favored on account of their extreme accuracy, reasonable cost and long service.

We take great pride in having maintained this reputation, not only in Gear Shaper Cutters, but also in all other types of Gear Cutting Tools, such as "Michigan" Ground Hobs and Involute Cutters.

We maintain a special gear engineering service which is at your disposal. We have a staff of engineers who are skilled in the technique of gearing, as well as experienced in practical gear cutting. Let us engineer your gear problems.

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Bulletin 709WT



Bulletin 712
With disconnect
switch and test
jacks

**Bulletin 709** In Three Forms



Form 1
With push
buttons



Form 2
Without



Form 3
With level

that provides correct control for every motorized machine

MODERN business demands safety for IVI man, motor and machine. Allen-Bradley Automatic Starters provide:

SAFETY TO MEN by substituting push button control for hand switches and by preventing accidental restarting of machinery in cases of line failure.

SAFETY TO MOTORS by preventing burnouts due to injurious overloads.

SAFETY TO MACHINES by preventing operation under abusive load conditions and by eliminating the judgment of the operator when starting motors.

Safety switch starters, fused switches and other manual motor starters are out-ofdate in this age of automatic machinery.

Modernize you impeliones with a modern line of automatic starters. Sell your machines "fully equipped" for maximum performance. Write for catalog.

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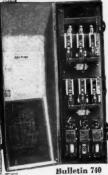




Bulletin 710
For large A.C.
Motors



Bulletin 265 For D. C. Motors



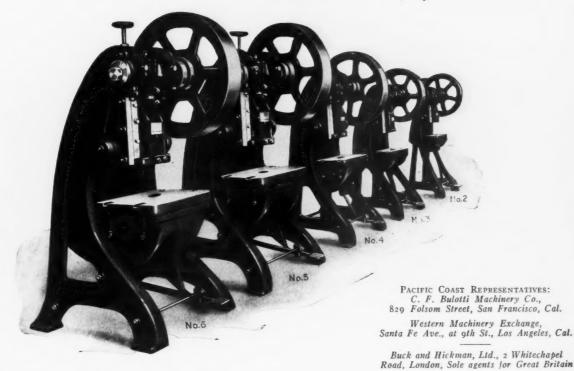
Bulletin 740 Velvet Smooth A.C. Starter



Push Button Automatic Starters

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Inclinable Open Back Power Presses with front adjustment



Built in five sizes in geared and flywheel Their flexibility of operation with dies upon sheet-metal has commended them to the trade as the most practical of all-purpose power presses.

"Adriance" Automatic Feeds may be attached to these presses, making complete automatic units for the increased efficiency required in modern mass production.

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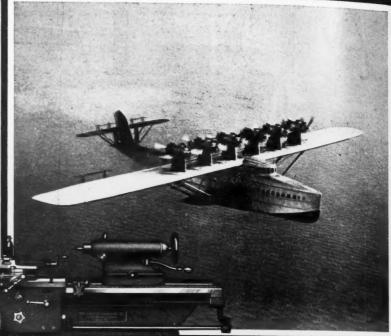
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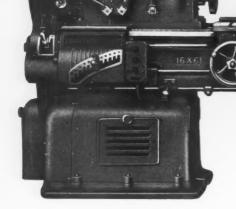
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The DO-X Flying Ship—soon to come to this country. A marvel in a marvelous age—the largest heavier than air craft in the world. Equipped with 12 engines—aggregating 6300 H.P. Has accommodations for and has carried more than a hundred passengers.

On its flight to America the Flying Ship will be equipped with Curtiss Conqueror engines.—In the Curtiss Factories Hendey Tools play a prominent part in the production scheme.

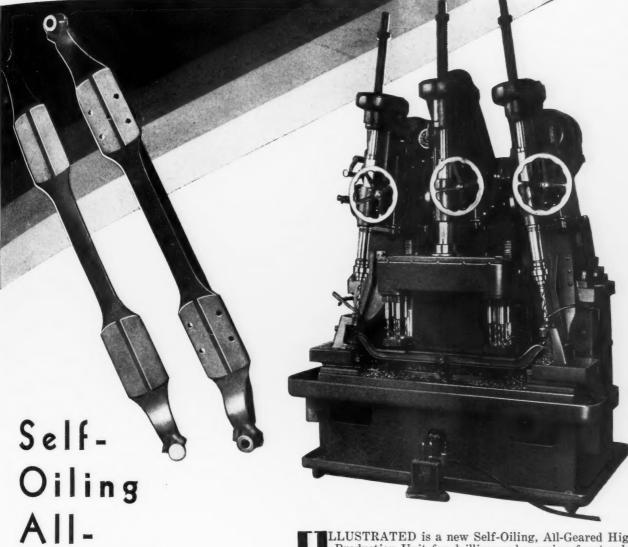
## HENDEY

A new industry follows the conquest of the air. Many of the best known plants in the country are building airplanes, motors, etc. The interest of the leaders in mechanical production is caught and held—the need of the finest equipment is imperative.

And in the lead for these needs, Hendey Lathes and Shapers have that machine tool quality which is the basis of quality production, machine tool efficiency that is essential in the manufacture of an efficient product. Write us for catalog.

#### THE HENDEY MACHINE COMPANY

TORRINGTON, CONN.



All-Geared DRILLING TRUCK AXLES

LLUSTRATED is a new Self-Oiling, All-Geared High Production Unit for drilling and reaming front axles for trucks. Note the one-piece base-table-column casting which provides a solid support for the work, wide bearing for the drill heads and makes the whole machine unusually strong and rigid.

The No. 242 center head carries one of our 10 spindle self-equalizing Auxiliary Heads for simultaneously drilling the two groups of spring pad holes. The No. 210 end heads, mounted on  $7\frac{1}{2}^{\circ}$  angle blocks and equipped with quick-change collets, drill and ream the king pin holes. To these are rigidly connected the slides on the fixture which centralize and clamp the axle forgings as the end heads are moved laterally by a powerful foot-controlled air-operated mechanism. Individual motor drives provide ample power and production is limited only by the capacity of cutting tools.

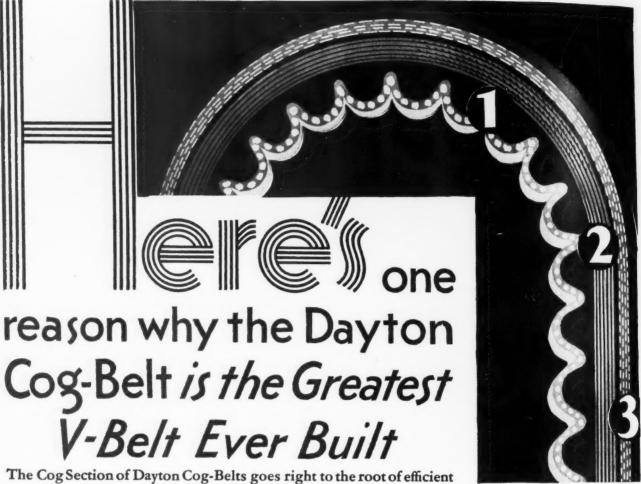
Self-Oiling, All-Geared High Production Units of the type shown, some of them with additional horizontal spindles for cross drilling, are used with excellent results by many manufacturers of automotive equipment.

The entire Self-Oiling, All-Geared line of Drilling and Cylinder Honing Machines is illustrated and described in our catalog, which will be sent to you promptly upon request. Write today for Catalog M.



BARNES DRILL CO. 814 Chestnut Street Rockford, Illinois, U. S. A.

MACHINERY, August, 1930-49



V-Belt power transmission. Look at the illustration.

. . . And without stretching. It stays permanently stretched in the finished belt.

Moreover, no other V-Belt is laminated and die-cut in its finished state. Daytons remain accurate . . . give truer alignment . . . have a firmer grip in the pulley grooves due to their raw edge contact-driving surface. They don't slip... require less maintenance and have longer life. They operate under less tension to transmit the maximum horsepower.

Get complete information about these amazingly efficient belts. Send for the Dayton Cog-Belt catalog and a sample section of the belt today.

THE DAYTON RUBBER MANUFACTURING CO. Dayton, Ohio

Factory Distributors in Principal Cities and all Westing-bouse Electric and Manufacturing Company Sales Offices

# COG-BELT DRIVES

The cog construction of Dayton Cog-Belts not only increases flexibility but does away with buckling, "rippling," "creeping" and lateral distortion, or bulging. Daytons run cooler and therefore last longer. The cog section is composed of specially processed, fibrereinforced rubber, giving a crosswise rigidity not found in any other V-type belt.

The central, "neutral axis" is the strength section. Nonstretchable. Built of cord fabric and vulcanized under tremendous tension. Extends across the entire width of the belt. Completely balanced. No displacement, no weaving, no twisting in the grooves possible.

The outer section is built of biascut fabric to accommodate bending without strain or distortion. This is another reason why Daytons do not heat, have greater pulling capacity, require less maintenance and last much longer than any other V-type belt.

Complete Drives-Pulleys and Belts in Stock-all Ratios 2 H. P. to 100 H. P.

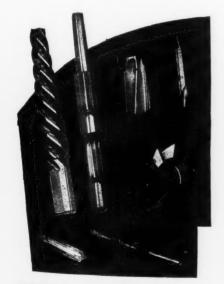


What a relief to escape from the swelter of sunbaked city streets to a breeze-swept beach—to shed soggy clothing—and plunge into the cool embrace of gurgling summer waters. As you slip along you can almost feel the years melt away.

Coolness means efficiency—and it's equally true of machines as well as humans. That's why Cogsdill drills, reamers, counterbores and special tools are the preferred cutting equipment in those shops where the metal is tough, the production pace fast and *Free Cutting* imperative.

Try out the built-in speed, stamina, and dependability of this superior line. You'll do more work and less sharpening; and watch production surge!

Catalogs on request.





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DETROIT, MICHIGAN

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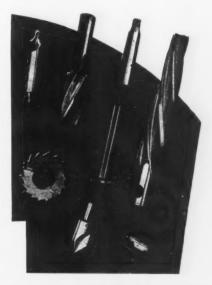
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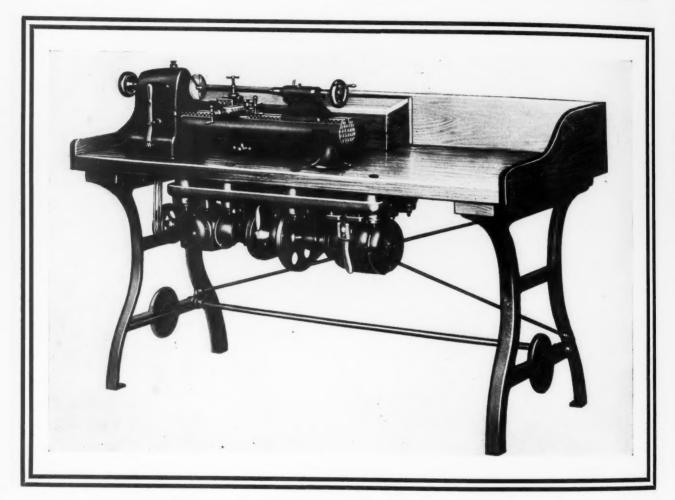
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MACHINERY, August, 1930-51

### ataract New! Bench Motor Driven Lathe



Send for details of the

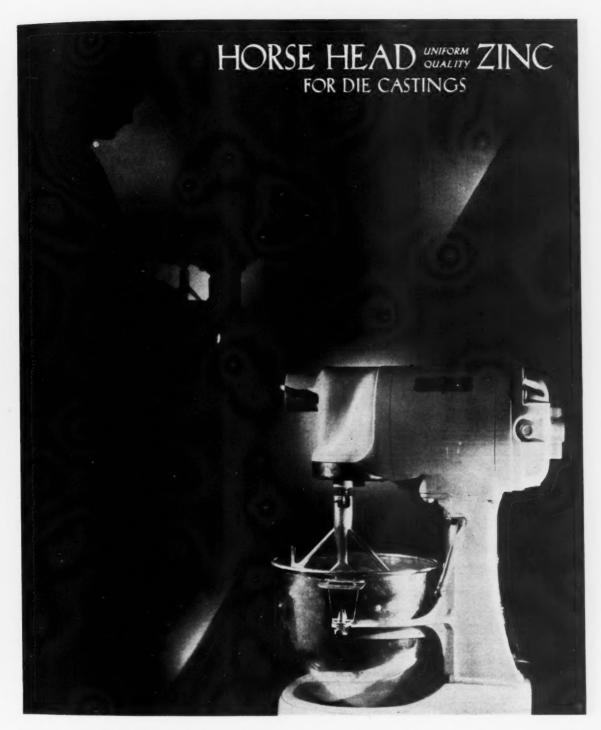
Precision Bench Lathes Precision Milling Machines

Sensitive Drilling Machines

Precision Tool Room

#### **Features of Construction**

Completely enclosed headstock with multiple belt drive to spindle . . . Six spindle speeds ranging from 140 to 1600 R. P. M . . . Forward and reverse obtained thru silent V belt transmission . . . Transmission fastened to bench with rubber mountings to deaden vibration . . . Chuck box on back of bench with space for full set of collets . . . Bench unit rigidly constructed with properly braced cast iron legs.



The kitchen aid, parts (including the motor housing and end pieces) are die cast from an alloy of Horse Head Zinc.

"COME OUT OF THE KITCHEN" sings this die cast labor saver to the housewife . . . . • Die castings are also industrial labor savers. Cast to close tolerances, they eliminate much machining. Flexible in design, they eliminate excess parts. . . . • And made from alloys of Horse Head uniform quality Zinc (as a majority of them are) they give the rugged, long= life service so necessary when labor saved is to become profit gained.



THE NEW JERSEY ZINC COMPANY

160 FRONT STREET, NEW YORK CITY



Zinc Metal and Alloys

Rolled Zinc

Zinc Pigments

Sulphuric Acid

Spiegeleiser

MACHINERY, August, 1930-53

### High Production



Forty-eight pages of information valuable to users of turret lathes are contained in this new catalog.

For those whose problems concern the manufacture of parts in large quantities, the catalog will suggest answers to many questions of "How can the job be done better, yet more quickly and at less cost?"

Those who must conform their production to the requirements of many diversified, small-lot jobs will also find in this new catalog complete discussion of the features which make Gisholt 1L and 2L Turret lathes so versatile and successful in small-lot production.

Catalog on Request

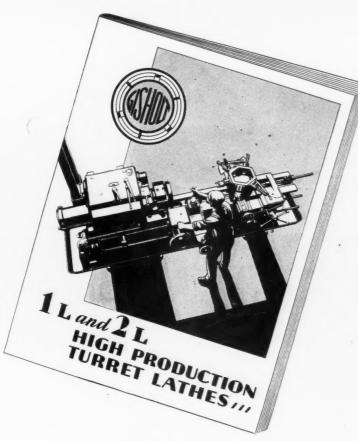
GISHOLT MACHINE CO

HEAVY DUTY TURRET LATHES

SIMPLIMATICS

HIGH PRODUCTION TURRET LATHES

#### Turret Lathes

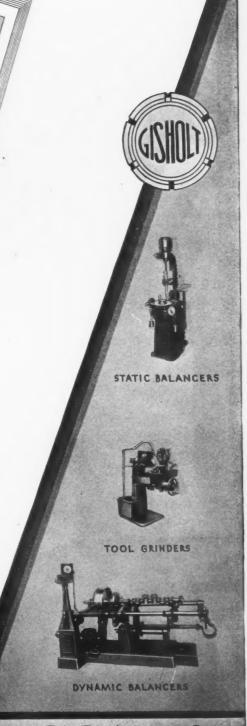


In addition to description of the machines themselves, the catalog illustrates a complete line of efficient standard tool equipment for a wide range of both chucking and bar work.

Finally, the catalog shows and describes interesting examples of special fixtures and tools designed by Gisholt Engineers for the solution of many unusual production problems.

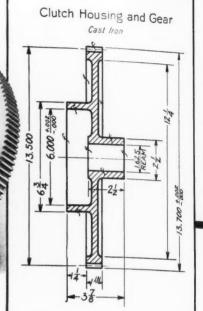
The catalog is most complete and will make a valuable addition to your file.

Address Dept. M



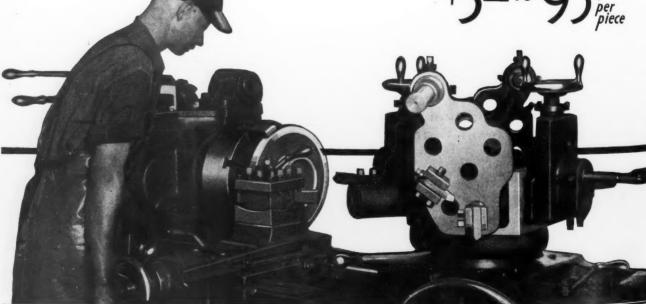
MADISON, WISCONSIN

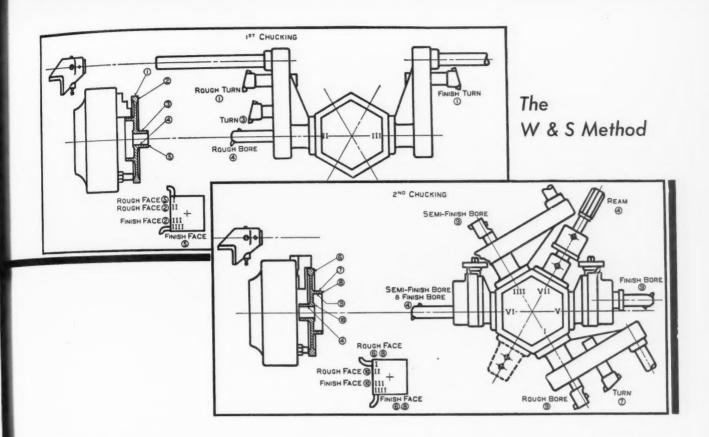
30 in a lot



on this Job

Mane their cost from 210 to C \$310 to 95¢ per piece





This Clutch Housing and Gear formerly required 124 minutes to machine on an old type turret lathe, in lots of 30... A W & S engineer recommended a new Warner & Swasey 2-A Turret Lathe for this and other work at The Battle Creek Wrapping Machine Co., and this job is now done in 38 minutes (including set-up time).

Read how they cut their cost\_

This interesting 16 page booklet has been sent to our mailing list but if you have not received your copy, send for it. It's free.



The

1880 Entering our Fifty-first year as Builders of Turret Lathes 1930

Warner &/Swasey

Cleveland, Ohio, U.S.A.

#### **Branch Offices**

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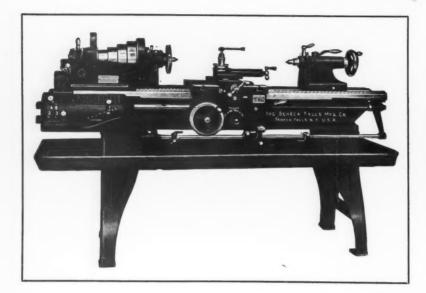
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## \* Here Is the "Star" \* of Engine Lathes!



"Star" Engine Lathes are made in 10", 12" and 14" swing, various bed lengths—all supplied with an unusually complete line of attachments.

We have interesting circulars awaiting your inquiry. And an engineering staff that will gladly estimate to your samples or prints. On every job within the unusually wide range of the "Star" Engine Lathe it proves the appropriateness of its name.

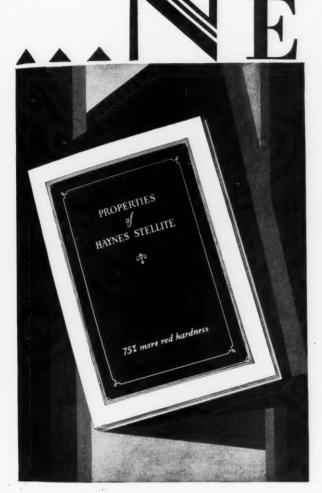
It truly stars on every phase of modern turning. Precision on long run production work; tool room accuracy on close limit work. And with a consistent economy of operation that brings turning costs to new low levels.

The "Star" is, with its unusually complete equipment of attachments, particularly adaptable to laboratory and experimental work. It is highly recommended by many leading vocational schools.

#### SENECA FALLS MACHINE COMPANY

SENECA FALLS, NEW YORK

The So-swing People





### W A A A A A EDITION OF

#### "Properties of Haynes Stellite"

Fully describes the physical and chemical properties and metallography of Haynes Stellite. Outlines the uses of the various grades of the alloy, covering both metal cutting tools and welding rod for hard facing wearing parts.

Don't fail to read the new section devoted to the most important property of Haynes Stellite—RED HARDNESS.

Your copy is ready. Fill out and return the coupon below.

#### HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

General Offices-Kokomo, Indiana

HAYNES STELLITE · HAYSTELLITE · HASCROME · HASTELLOY Quality Products, Fair Prices, Dependable Supply, Engineering Service

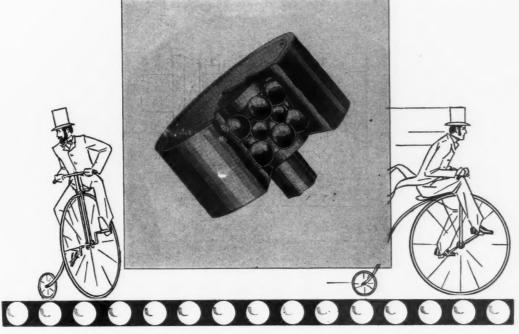
					M-8-3
Haynes	Stellite	Compan	y, Kokomo	. Indiana	
Without of your	obligat new boo	ion on m	part, ple operties of	ase send m Haynes S	e a copy tellite."
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MACHINERY, August, 1930-59



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#### THE WORLD ICHTS FRICTION



The possibilities of ball bearings in overcoming friction were gradually being explored. Thus, one inventor originated an installation consisting of three sets of balls which turned against each other. This was in 1863-and in a few years the ball bearing was to make possible the 'safety' bicycle.

THE finest steels will not in themselves produce perfect ball bearings. Modern mechanisms require ball bearings of almost incredible accuracy. And that results only from human craftsmanship.





Torrington Ball Bearings easily meet the strictest engineering requirements . . . for the Torrington plants are operated by men who have specialized for a lifetime in precision work.

Torrington methods and Torrington men produce ball bearings not excelled for essen-

tial accuracy, and eco-

nomical long life.

DISTRICT SALES REPRESENTATIVES

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This is the last of our illustrations "The World Fights Friction"...a history of the development of ball bearings. The originals of many of the illustrations used in this series are in the libraries of France... and for the excellent photostatic prints in the New York Public Library we are indebted to "Le Roulement a Travers les Ages," presented by the Compagnie d'Applications Mecaniques.

The Torrington Company
Torrington, Conn., U.S.A.



HELICAL-GASHED HOB

# No Hob is better than its cutting EDGES

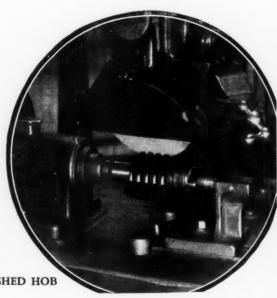
THE sharpness, accuracy, uniformity, and alignment of the many cutting edges on a hob control, to a great degree, the continued accuracy and life of the tool. For first-class hob sharpening work, we herewith call to your attention the Barber-Colman No. 3 Hob Sharpening Machine. A few simple settings are made—then the machine performs all the sharpening work automatically. Accurate indexing for the gashes is automatically controlled, the rate of feed and the amount of material to be removed are governed by positive mechanical means, straight-gashed or helical-gashed hobs can be handled, and, when necessary, a hook or rake can be produced instead of the usual true radial face. The results: more accurately sharpened hobs, longer life for the hobs in the hobbing machines, more satisfactory gears, and greater efficiency in the gear cutting department.

### Use the Barber-Colman No. 3 Hob Sharpening Machine



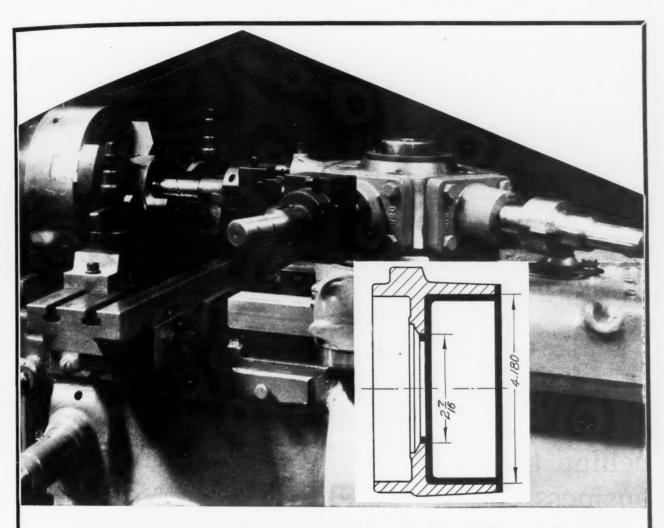
#### Capacities

The Barber-Colman No. 3 Automatic Hob Sharpening Machine, as shown at left, will handle hobs up to 4 inches in diameter and 4 inches long. (There is a larger Barber-Colman Hob Sharpening Machine for larger hobs.) It will handle straight-gashed hobs and also hobs with either right or left-hand helical gashes. It is motor-driven and is a complete, self-contained unit. Index plates are furnished for hobs having from 10 to 16 gashes. All controls are conveniently located on the operating side of the machine.



STRAIGHT-GASHED HOB

BARBER-COLMAN COMPANY General Offices and Plant, ROCKFORD, ILL., U.S.A.



54

per HOUR The machining of these Bearing Collars is being handled on the Potter & Johnston 4-D Automatic, in the following manner:

#### 1st Turret Face

Rough bore 4.180" diameter Rough face bottom of same Rough face end Rough bore 2 7/16" diameter

#### 2nd Turret Face

Finish above cuts and chamfer

#### 3rd Turret Face

Ream hole 4.180" diameter

One operator is handling a battery of three Automatics, machining 54 pieces per hour—thus bringing the labor cost down to a minimum, and resulting in a distinct saving over the best which could be accomplished by the former method.

Have you investigated the savings which can be accomplished on your own class of work? Just send in your prints for full information.

POTTER & JOHNSTON MACHINE CO. Pawtucket, Rhode Island, U. S. A.

Automatics

# The Business End of Gould & Eberhardt Manufacturing Shapers

The tool head, unusually rigid and compact, built to withstand heavy cuts at fast ram speeds; the improved cross-rail that minimizes deflection; slide, with single plate narrow guide; rigid table and support with positive lock; the offset vise—all may well be termed the business end of the G & E Manufacturing Shaper, for they are capable of producing the hardest shaper jobs

#### —and behind this business end

is the heavily ribbed ram, guided and supported within 55° "V" Ways of the unusually wide, deep and symmetrical frame. There is the sturdy rocker arm and the exclusive double crank gear transmission, with all heat treated gears, including main crank gears.

And there is the motor, built in, coupled directly to the transmission drive shaft, thereby eliminating chain or belt connections.

Such are some of the exclusive and patented features of G & E Manufacturing Shapers, but they tell the story only in part. Bulletin 190 tells it all. Send for your copy now.



Goulo & Eberharot

NEWARK (Irvington), N. J., U. S. A

#### Material Saving

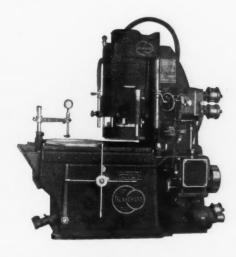


No. 6
of Six Reasons
Why it Pays to

Blanchard Grind"

Savings over other methods by Blanchard Grinding often show a reduction in the finish allowance of one half. Stock can be trimmed down to only enough to clean up the surface. The grinding wheel does not need to get under the "skin" of castings and is not damaged by sand or hard spots in the metal.

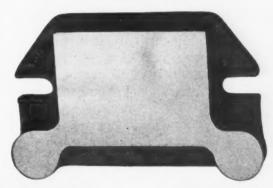
A further saving is made in money invested in material. There is less work in process where Blanchard Grinding is used because the Blanchard finishes from the rough in one operation.





#### Die Shoe

Savings in material amount to over 10 cents on each piece



Material - - Semi-Steel
Dimension - - 13" x 8½"
Stock per side - - ½
No. sides ground - - 2
Limits - Parallel within .001
Production

16 surfaces, 8 pieces per hour

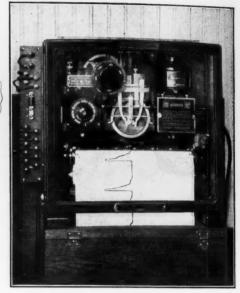
THE BLANCHARD MACHINE CO. 64 STATE STREET CAMBRIDGE, MASS.

ACCURACY-SPEED-ADAPTABILITY-FIXTURE SAVING-OPERATION SAVING-MATERIAL SAVING



### **HOMO** TEMPERING





#### Cuts Time in Half for Coloring Link-Belt Parts

Rapid, automatically reversed circulation of electrically-heated air within the Homo Tempering Furnace enables Link-Belt to maintain their exceedingly high standards of quality for the coloring of steel parts. It also cuts in half the time formerly required for this operation. Temperature limits are extremely narrow, and variations from these limits are not tolerated.

Homo Tempering is clean. Part of the time-saving results from the fact that no cleaning is required when the work comes from the furnace. The method is fast, and above all it is accurate. It meets the exacting demands imposed by Link-Belt and by other modern manufacturers.

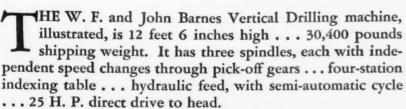
Catalog 93-Y gives complete details. It will be sent on request.



Link-Belt Furnace.



### BIGONE for HEAVY DUTY DRILLING

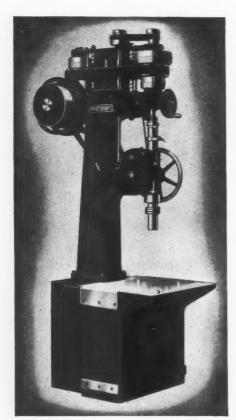


Additional details supplied promptly upon request . . . Nineteen Barnes High Production Drilling Machines applied to a wide variety of work are illustrated and described in our booklet entitled "Performance" . . . Write to-day for a copy.

W.F. and John Bar

# HE MAN behind the drill knows FOOTBURT





FOOTBURT

REPUTATION can be just as important as specifications when purchasing machine tools. The man behind the machine will tell you, if you don't already know it, that FOOTBURT Sipp Sensitives are mighty fine machines, always have been dependable and accurate, and no doubt always will be a step ahead in design and construction.

Before buying Sensitives be sure to talk to a mechanic that has used a Sipp or FOOTBURT Sipp.

There is a size and style in the line for nearly every light drilling job. Machines are built in four sizes and in one to eight spindle models. The smallest size, either bench or floor type, handles drills as small as No. 80. The largest has a capacity or  $1\frac{1}{4}$  in cast iron. There are over sixty standard styles and spindle combinations from which to choose.

#### FEATURES

Automatic Spring Idler • Quick Speed Change
Sipp Original Straight Drive Belt • All Ball Bearing
Balanced Solid Cone Pulleys • Hand or Power Feed

THE FOOTE-BURT COMPANY . CLEVELAND, OHIO DETROIT OFFICE - 4-151 GENERAL MOTORS BUILDING

### FOOTBURT SIPP DRILLS

# SPRINGFIELD Ball Bearing Geared Head ENGINE LATHES

### Measuring Up!

Twelve speeds, directly selected, from 14 gears. No idle gears ever in mesh.

All journals (except main spindle) ball bearing, including thrust.

Noiseless and chatterless head, free from vibration.

Handy adjustment of main spindle bearing without removing cover or caps.

Concentrated control.

Greater accuracy — production. Less power consumption.

Springfield Engine Lathes measure up to the most advanced standards of present day turning efficiency on all work within their wide capacities.

Look through this partial list of features. Is it any wonder that a performance-won reputation for high earning ability is consistent with all users of these machines?

Let us give you the Springfield story in its most convincing form — with estimates. Samples or prints of your knottiest turning job are solicited. Or, if you prefer, ask for catalogs.





He said, » »
"Absolutely Correct"

THIS was the reply of a well-known manufacturer when we asked, "How close must the accuracies of your form tools and hobs be checked?" Another manufacturer of fine tools replied, "To .0001 inch."

These and many others use the B & L Contour Measuring Pro-

jector for accurately checking fine work and they enthusiastically pronounce it to be highly satisfactory and all that can be desired. Furthermore, practically all of these measurements are made by unskilled operators, so simple is this extremely precise instrument to use.

Let us tell you how you can use the Contour Measuring Projector to help you make your product of uniform high quality. Write today.

#### BAUSCH & LOMB OPTICAL COMPANY

619 St. Paul Street

Rochester, New York



### BAUSCHELOMB

MAKERS OF ORTHOGON EYEGLASS LENSES FOR BETTER VISION

THE SMALLEST, FASTEST, HANDIEST GRINDER

### "The handiest tool, at any price, that has come out in the last ten years"

says a CLEVELAND COMPANY

about the Kipp
Air Grinder

We said it when we put it on the market, and now users everywhere are saying it—that the Kipp Air Grinder is the handiest little tool ever made for the tool room, machine shop, die shop and assembly bench.

It's only 7¾ inches long—hardly longer than a fountain pen, 15 ounces in weight, but it runs at a speed of 40,000 r. p. m. on air pressures as low as 20 pounds.

And it grinds. It cuts metal like a big wheel grinder, but is always at the workman's finger tips. It gets into inaccessible places to blend radii and add final touches. It touches off tool steel neatly and quickly. It shapes lathe bits and small end mills, and does a thousand and one other jobs.

No tool room, die shop, metal pattern shop or machine shop should be without it. It often saves its price on a single job.

MADISON-KIPP CORPORATION 203 Waubesa St. MADISON, WISCONSIN GRINDER DIVISION

Manufacturers of Air Grinders, Fresh Oil Systems, Mechanical Lubricators, Die Casting Machines, Die Casting Dies—See also pages 104-241.





#### on Ten Days Free Trial

The Kipp Air Grinder, complete with four grinding wheels, hose and hose connections, will be sent on ten days free trial to any firm having a satisfactory credit rating.

Specify Model AG for pressures 50 to 100 pounds. Specify Model AGL for pressures 20 to 50 pounds.

Kipp Mounted Grinding Wheels

and Smoothing Stones are made in eighty-seven different sizes and shapes for grinding or polishing any irregular or plain surfaces, in grades or grain for any metal.

#### This is What They Say:

"One of the most useful tools for odd jobs we have ever had. Paid for itself in one week."

AN INDIANA CONCERN

"The most useful tool of its kind we ever bought; it does away with a great deal of hand stoning."

A LARGE EASTERN MANUFACTURER

"We consider this grinder of great value to us in finishing Drop Forge Shop Dies. Since trying the first grinder we have purchased two more."

A WISCONSIN CORPORATION

#### ORDER BLANK

MADISON-KIPP CORPORATION 203 Waubesa Street, Madison, Wisconsin

Send one Kipp Air Grinder AGAGAGL—at \$25.00, net 30 days, postpaid. If it is not satisfactory we will return invoice and grinder on or before the 10th day after date of invoice. [Note: If you prefer to use your regular office form attach this coupon to it and copy the above return arrangement on your order for a complete record.]

Ship to

Address

Order

Number

Signed

Title

### 77 SETS

### of ANTI-FRICTION BEARINGS in the *Libby* INTERNATIONAL

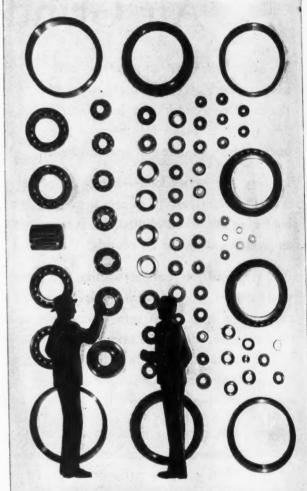
#### Save Money in Costly Repairs

IN a Heavy Duty Turret Lathe, such as The LIBBY International, the stress and strain on all working parts would soon cause wear and breakage resulting in costly repairs, if unusual precaution were not taken to prevent them.

77 sets of ball and roller bearings—each set carefully chosen for the duty it performs—are included in the construction of The LIBBY. Minimizing friction, absorbing shocks and strains, carrying both radial and thrust loads, these 77 sets of Anti-Friction Bearings reduce wear and give longer life to the entire machine.

Insist upon knowing how many, and what types of bearings are incorporated in the construction of your next heavy turret lathe purchase. Your repair bills will be lower, and the longer life of the machine will pay you greater profits on your investment.

Let us tell you more about the superior and exclusive features of The LIBBY. Your inquiries are solicited. No obligation is involved.







#### for every job

A wrench for every one of the many requirements of plant and factory—that's what Williams' Superior line offers.

For nearly fifty years Williams' Wrenches have been the choice of critical tool users. Improved design,

accurate machining, tough strength and long life account for their popularity. All are dependable tools, moderately priced and extremely well made.

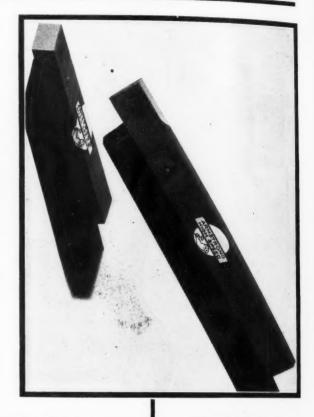
If your Mill Supply Jobber cannot furnish the style and size you require, write for our Wrench Book.

J. H. WILLIAMS & CO. — "The Wrench People"
New York BUFFALO Chicago





## Fine Tools in the rough—ARMSTRONG Cutter Bits and Blades



With the universal adoption of the Armstrong System of Tool Holders, steel companies everywhere supply, as standard shapes, lengths of High Speed Steel to fit ARMSTRONG Tool Holders. While it is unquestionably an advantage to machinists to be able to buy anywhere high speed steel in the proper forms for cutter bits and blades, it is not always the best policy to do so. The working efficiency of any tool holder depends to a marked degree on the quality of the bit used and in view of the small amount of steel actually consumed in a tool bit, it is a false economy to use bits made from run-of-the-mill steels produced on a tonnage basis.



This decalcomania marks each ARMSTRONG Bit and Blade.

Remember the words "ARMSTRONG HIGH SPEED." ARMSTRONG Bits and Blades assure greatest efficiency from ARMSTRONG Tool Holders for they are more than shapes of High Speed Steel. Each is a fine tool in the rough, the product of long and specialized experience, special furnaces and special equipment and processes. It is sound business to insist on ARMSTRONG Bits and Blades.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

313 N. Francisco Ave., CHICAGO, U.S.A.

#### ARMSTRONG

Tool Holders
"C" Clamps Lathe Dogs
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches
Chain Pipe Wrenches
Pipe Wrenches

#### ARMSTRONG BROS.

Solid Dies and Stocks
Adjustable Dies and Stocks
Ratchet Stocks
Triplex Stocks
Pipe Cutters
Chain Vises
Hinged Pipe Vises
Knife Blade Cutter Wheels



W R I T E for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools.

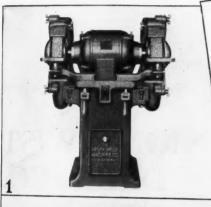
### ARABE MARK REG. IN U.S.-PAT. OFFICE

74—MACHINERY, August, 1930

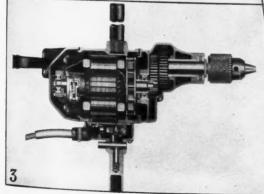
#### Nickel Alloy Steel... for Electric Machine Tools

"the only steel we have ever found to be entirely satisfactory"









(1) Shows Hisey-Wolf Grinder with Nickel Chrome Steel spindle, (SAE 3140); (2) "Tex Drive" Buffer with one-piece Nickel Chrome Steel spindle; (3) Hisey Electric Drill using special Nickel Alloy Steel for all gears and spindles. Mfd. by THE HISEY-WOLF MACHINE CO., Cincinnati, Ohio.

The Hisey Wall Machine Co. Partable Electric Machine Cools

Cincinnati. Ohio. U.S.A. ALL OUR EMPIREMENT GROWN THE WAY CONTRACT OF CONTRACT

November 13th., 1929.

International Mickel Company, Inc., 67 Wall Street, New York, N.Y.

with reference to photographs Nos. 1 and 2;

with reference to photographs Nos. 1 and 2;

feature employing spimiles of heat-treated Nickel Chrome
facture employing spimiles of heat-treated Nickel Chrome
Steel. We have adopted this material, because it much
better resists the torsional and springing strains to
better resists the torsional and springing strains to
better resists the torsional and springing strains to
better testing the torsional fire and of an inferior steel.

The nickel content we have found by
experiment
The nickel content we have smount of nickel
overcomes this difficulty entirely.

The amount of nickel
we predetermine depending on the length and diameter of
the shaft in question.

HISET Electric Drill in which all gears and spindles are made of a special alloy steel not covered by a regular SAE number, but which also has a certain Nickel content. Satisfactory, but which also has a certain Nickel and entirely satisfactory, only steel best treatments affording maximum toughness. It permits heat treatments affording the finished gear yet does not hip be filed. This naturally precludes any possibility of stripping. Hoping this data is of interest to you,

THE HISET-HOLL FOR INE COMPANY, Yours very truly,

CH: LZ

There is a Nickel Alloy Steel suitable for every purpose where durability and dependability are requisites. The experience of thousands of users has contributed to a fund of valuable information on Nickel Steel properties and applications. Details will be gladly furnished by our staff of engineers.

FOR ALLOY STEEL

Send for List of Available Publications on Nickel and its Alloys



NICKE THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y



### Milling Cutters with Undercut Teeth

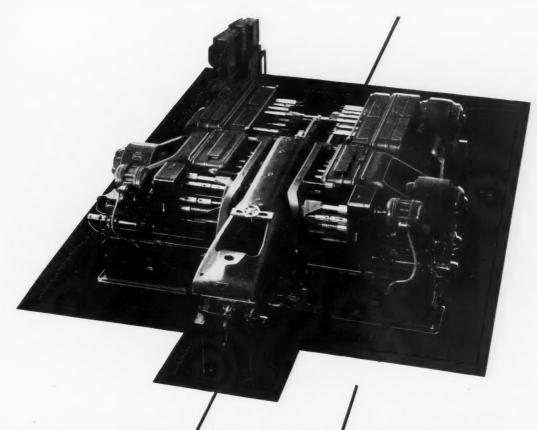
57 sizes ranging from 3/16-inch to 6-inch face, 2¼-inch diameter to 4-inch diameter, both Carbon and High Speed Steel cutters, of type shown, are carried in stock for immediate shipment.

See Catalog "L-2" for full details.

As to specials . . . well just send us your specifications for estimates.

The teeth in these Cutters are designed to remove the greatest amount of material and leave a smooth surface.





#### 10 LARGE TRACTOR FRAMES DRILLED REAMED AND TAPPED EVERY HOUR

Drilling 30 holes, reaming 2 holes and tapping 28 holes are the operations, the combination NATCO Driller and Tapper illustrated above is performing on 10 large tractor frames every hour.

By use of a sliding fixture all the above operations are performed with only one loading of the piece. It is loaded in the machine in the drilling position and after the drilling operation, the fixture is traversed forward to the second position where the reaming and tapping operations are performed. The piece is then unloaded, fixture returned to first position and the cycle is completed.

To the average buyer of such equip-

ment the above would appear as a special machine—and it is as far as the work it is doing is concerned—but it is built of STANDARD NATCO UNITS—a feature which permits the purchase of special equipment at a much lower cost.

This is another example of NATCO Drilling Equipment being used to increase production and lower costs. Whether it is vertical or horizontal, multiple or single spindle drilling machines that are required NATCO is prepared to solve your 'hole' problem.

Why not take advantage of the broad experience of our Engineers and let us submit our recommendations.

"NATCO Solves Your 'Hole' Problem"

Chicago Sales Office: 1300 Engineering Building 205 West Wacker Drive

Detroit Sales Office: 807 Fisher Building European Sales Office: 20-22 Rue des Petits Hotels Paris, France

THE NATIONAL AUTOMATIC TOOL CO. AICHMOND, INDIANA, U. S. A.

### BAKER

#### HYDRAULIC FEED EQUIPMENT

Baker hydraulic feed equipment is furnished in three sizes of vertical machines, and three corresponding sizes of horizontal (way type) machines.

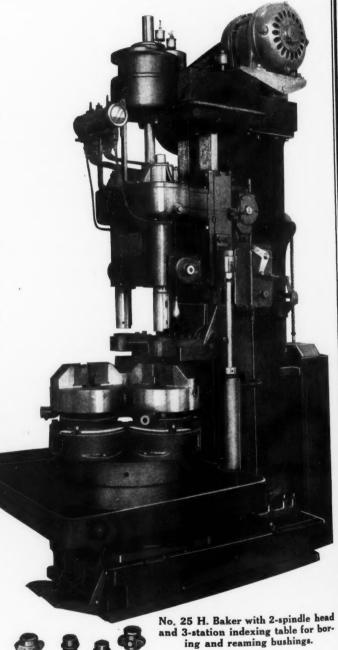
These machines can be equipped with any combination of multiple spindles and number of stations, both for successive operations on the same piece, or for machining a quantity of the same piece simultaneously.

By an ingenious device this type of machine can now be furnished with positive lead for tapping operations, which opens up a further field for Baker Hydraulic Equipment.

All machines have Double Cylinder ("Twin Pull") Drive.

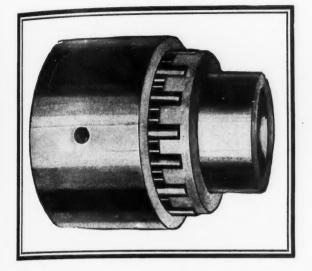
Automatic index can also be furnished if desired.

Send us your blueprints for estimates.



BAKER BROTHERS, Inc., Toledo, Ohio, U.S.A.

Builders of Boring, Drilling, Tapping, Keyseating and Slotting Equipment



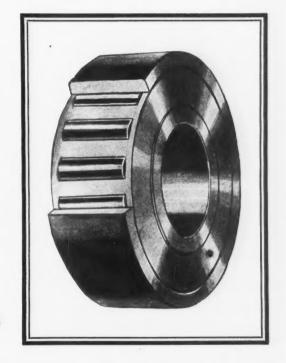
# Anticipating tomorrow's needs

What will tomorrow demand from bearings? Certainly far more than "today"!

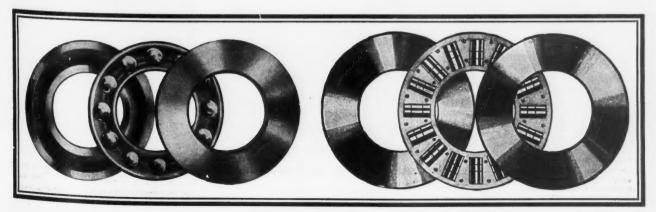
Superior Ball and Roller Bearings are designed and built with this accepted fact in mind. When you install Superior units in your plant equipment and products you install bearings that stay modern for life. No one can doubt the economy of such equipment.

But to make abstract fact more impressive we've collected actual facts and figures to prove the superior efficiency and economy of Superior Ball and Roller Bearings—Write for this interesting and convincing proof!

THE BALL & ROLLER BEARING CO. DANBURY, CONN.



#### SUPERIOR Ball and BEARINGS





DURING the Civil War a Confederate officer gave this simple formula for winning battles, "Get there fustest with the mostest men".

Modern electric steel castings help the manufacturer to do exactly that, in a business way.

For today, we swing along to an industrial tempo the like of which

the world has never seen. Better products are bettered. Designs are constantly improved.

But the costs of producing are driven lower and lower.

#### The Three Points

And truly modern manufacturing plants must seek three things, to which old-fashioned management paid only cursory attention:

- (1) super-quality of product
- (2) lower production costs
- (3) the ability to change design or methods upon a moment's notice.

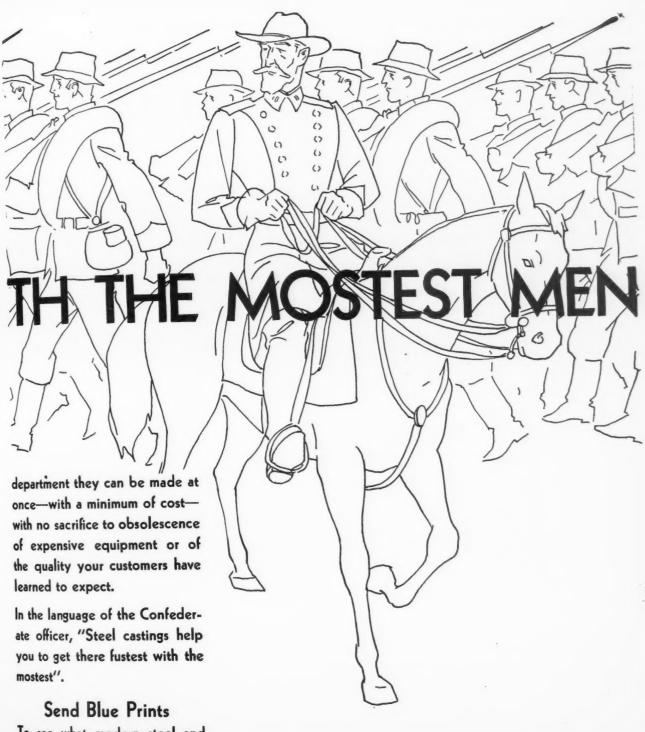
Especially to the manufacturer using small variable-section and complicated parts, electric steel castings bring an answer on all three points.

#### More Important

Even more important, to economical production, especially when the run is short—electric steel castings involve no high equipment investment or special setups. Constant change, the watchword of progress, is no financial or physical hazard.

When new designs are demanded from the field or engineering



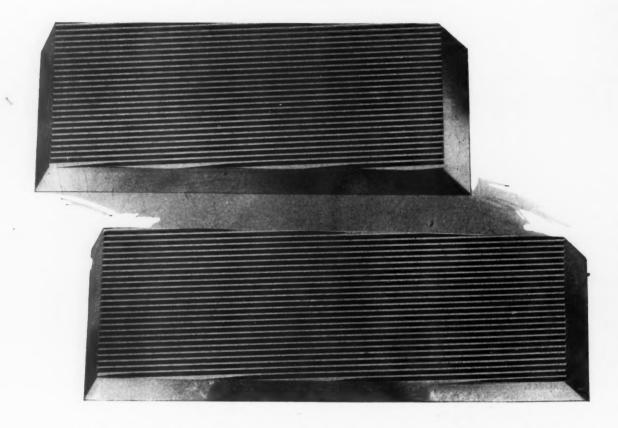


To see what modern steel and alloy steel castings can do for you, send blue prints of your most troublesome parts to Sivyer. There is no obligation, of course.

SIVYER STEEL CASTING COMPANY Chicago

### BATH Ground Thread Rolling Dies

A New Factor in Making Precision Screws on a High Production Basis



Bath Rolling Dies are "Hardened in the Solid" and "Thread Ground from the Solid" the same as Bath Taps. All heat treating distortion is eliminated in the thread grinding.

Bath Ground Taps solve the tapped hole problem—Bath Ground Roll Dies match the accuracy of the tapped hole with precision screws approaching ground taps in accuracy.

Equally successful in rolling brass, aluminum and steel. Heat treatments are carefully controlled to give maximum productive life.

Write for price list and further information.





Were there an individual musician for every instrument in the average dance orchestra, it would more closely resemble the Philadelphia Symphony. Economical necessity has made "doubling in brass" a fine art with the rhythm boys; to-day they triple in strings and just run wild with the reeds. For a glittering example of multiple operation, watch a saxophone player in action!



Turn multiple diameters in ONE operation—the So-swing way!

Have you quartets of ordinary lathes in your plants that can be replaced by a "solo" So-swing? One of these work-hogs can harmonize your production turning with a range of economies that will be sweet music to your ears. Multiple cutting tools, automatic operation, brute power, hardened steel ways—all So-swing features—results in battery-capacity from each individual machine, bringing costs 'way down and earnings 'way up. Ask us for details.

#### SENECA FALLS MACHINE COMPANY

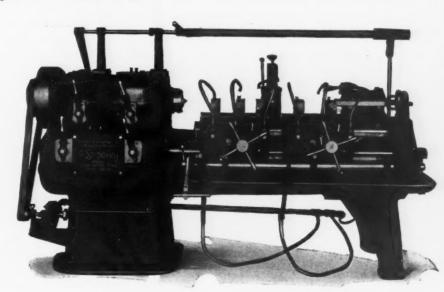
Seneca Falls, N. Y.

The So-swing People

District Sales Manager for Michigan, Ohio, Wisconsin, Illinois and Indiana: W. H. Nettle, 10-217 Gen. Motors Bldg., Detroit, Mich.

Pacific Coast Representative: Louis G. Henes Machinery Co., San Francisco and Los Angeles.

European Office: 21 rue George Sand, Paris, France, in charge of George E. Fogarty, European Sales Manager.

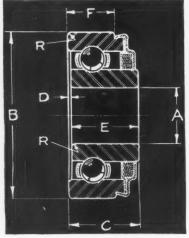


### So-swing LATHES



# Another "PRECISION" Bearing





Write for the "Greaseal" Data Sheets, showing details of application

#### BALL BEARING

A Notably Better Bearing
With Distinctive Economic Advantages

A self-contained, self-sealed, grease-packed, dirtproof bearing with a larger grease capacity, ready for years of service without renewal of lubricant.

Needs only the most simple and inexpensive mounting, with the very minimum of machining and assembling cost.

AN ALL-STEEL BEARING, WITH A SOLID, ONE-PIECE OUTER RING.

Bearing Number	Bore "A"		O. Dia. "B"		Width "C"	Offset "D"	Length "E"	Width "F"	RAD. "R"	
	M. M.	Inches	M. M.	Inches	Inches	Inches	Inches	Inches	M. M.	Inches
GS-96	6.	.2362	19	.7480	.3543	.016	.3383	.2362	1	.039
GS-97	7	.2756	22	.8661	.4060	.016	.3900	.2756	1	.039
GS-98	8	.3150	22	.8661	.4060	.016	.3900	.2756	1	.039
GS-98246	6	.2362	24	.9449	.4060	.016	.3900	.2756	1	.039
GS-98247	7	.2756	24	.9449	.4060	.016	.3900	.2756	1	.039
GS-9824	8	.3150	24	.9449	.4060	.016	.3900	.2756	1	.039
GS-99	9	.3543	26	1.0236	.4527	.016	.4367	.3150	1	.039
GS-200	10	.3937	30	1.1811	.5118	.016	.4958	.3543	1	.039
GS-201	12	.4724	32	1.2598	.5512	.016	.5352	.3937	1	.039
GS-202	15	.5905	35	1.3780	.5905	.016	.5745	.4330	1 .	.039
GS-203	17	.6693	40	1.5748	.6693	.016	.6533	.4724	1	.039
GS-204	20	.7874	47	1.8504	.7480	.016	.7320	.5512	1	.039
GS-205	25	.9843	52	2.0472	.7874	.016	.7714	.5906	1	.039

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.



Have you a troublesome turning job where cutting difficulties cause tool breakage and chatter and slow down speed? *That's* the job for a Carbo-Lathe, a *modern* lathe built with the necessary rigidity and smooth flow of power to make possible efficient operation at the super speeds called for by the most modern cutting tools.

This job—turning segmented commutators—taking intermittent cuts smoothly, evenly, fast—is a typical Carbo-Lathe job photographed at the Van Dorn Electric Tool Co. The commutators are from  $\frac{1}{2}$ " to  $\frac{1}{2}$ " long and  $\frac{3}{4}$ " to  $\frac{2}{2}$ " in diameter; limits, plus or minus  $\frac{1}{64}$ "; production ranges from 10 to 80 per hour, according to size, and—as is natural—the Van Dorn people consider their Carbo-Lathe installation "very satisfactory."

Send us rough and finished samples of parts (preferably between 7" x 18") for production cost estimates.

## PORTER-CABLE MACHINE COMPANY OF SYRACUSE, N.Y.

MACHINERY, August, 1930—97

Salina and Wolf Streets

### MULT-AU-MATICS

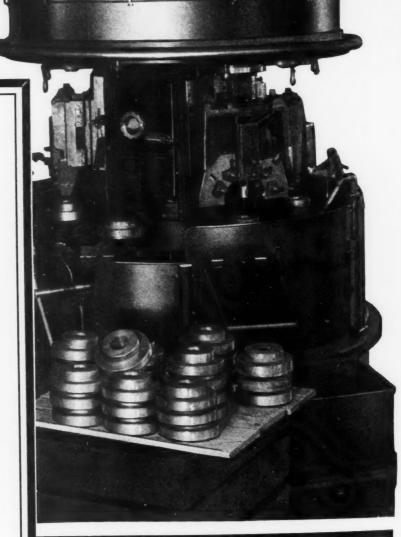




is a hopeless task with the machines of yesterday. Shop equipment that fails to keep up with production schedules is profitless.

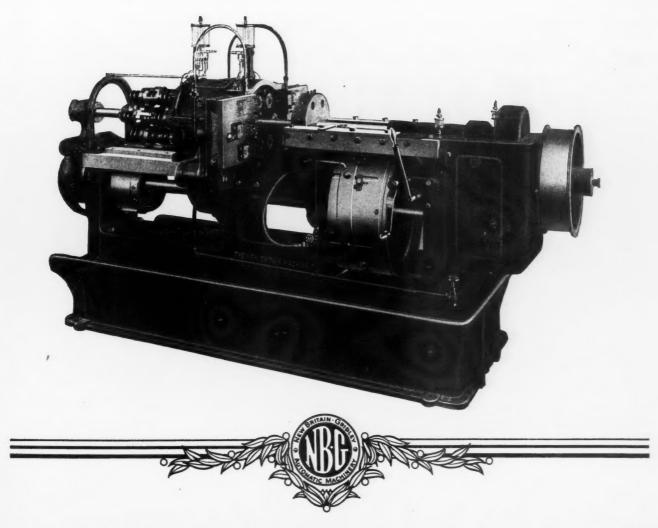
Mult-Au-Matics will always maintain a profitable lead over the most exacting schedules you may have regardless of whether it is production of small lots or long runs. One Mult-Au-Matic will replace a whole battery of slow moving, attention demanding, hand chucking machines.

Better let a Bullard engineer give you the facts. A request will bring him to you.



### The BULLARD COMPANY

Bridgeport, Conn.



### NEW BRITAIN SEXTUPLE BAR MACHINES

Designed for blanking studs, pins, bushings, rolls, nuts, or any part which may be completed by a combination forming and cut-off operation, with or without drilling. Identical operations are performed in six positions simultaneously. Six pieces are produced each cycle.

For those jobs requiring drilling, indexing stops are available which operate automatically and with extreme rapidity. The use of these stops allows overall length of pieces to be held within close limits, since stock is not fed to drill points.

We will be glad to consider your "Sextuple" jobs or to send you further details covering New Britain Sextuple Machines.

## THE NEW BRITAIN-GRIDLEY MACHINE CO. NEW BRITAIN, CONN.

u. S. A.

## THE FORG

A National High Duty Forging Machine

100-Machinery, August, 1930

## ING TREND

In machine forging the trend is increasingly toward close limit, low weight forgings; accurate forgings with minimum finish allowance, often eliminating some machining operations entirely, and requiring less metal.

The New National High Duty Forging Machines are responsible for this trend.

> National High Duty Forging Machines are sold by

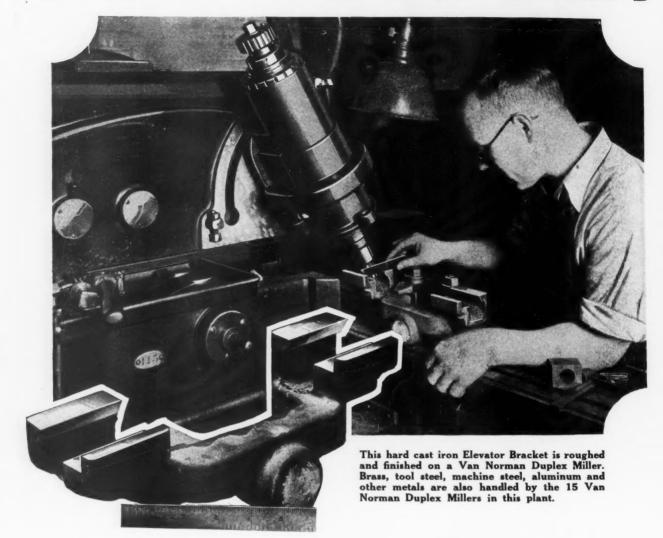
CHAMBERSBURG-NATIONAL

Officer of

CHAMBERSBURG, PA. TIFFIN, OHIO
NEW YORK, 152 W. 42ad 51 CHICAGO, 565 W. Washington 51.
DETROIT, 2457 Woodward Avenue.

MACHINERY CO.
OHIO

## VAN NORMAN



### Three Set-Ups Reduced to One with Van Normans

Fifteen years' experience with Van Norman Millers have made them indispensable in the plant of The Package Machinery Co., Springfield, Mass. Without Van Normans it would not be possible to keep set-up and cutter expenses within the present low limits.

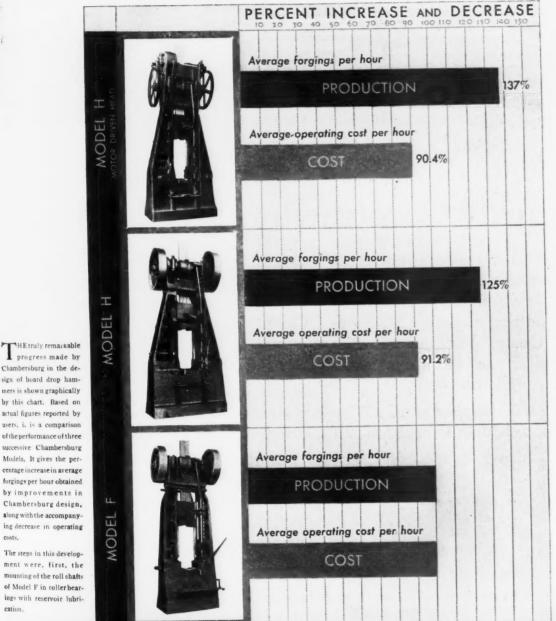
Work formerly requiring three set-ups is now done in one, and the fact that skilled machinists are not required still further lowers operating expenses.

Ask for illustrated folders.

Five Sizes-Nothing Untried-Hundreds in Use

Van Norman Machine Tool Co., Springfield, Mass., U. S. A.

### STEPS IN INCREASING THE OUTPUT OF THE HAMMER BOARD DROP



users, it is a comparis

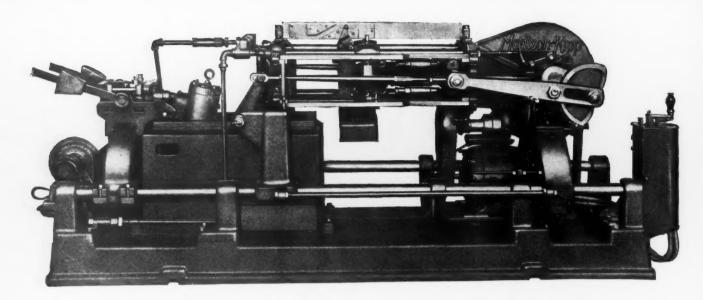
cation.

troduction of an entirely new drop hammer design-the epoch-making Model H, which has since shown its ability to produce 25 % more forgings per hour than Model F.

Now Chambersburg has perfected the motor driven head for the board drop hammer. Hammers equipped with this head have been running for almost a year now, and have so far shown a 10% increase over their belt-driven performance-a 37% increase in forging output over Model F.

## HAMBERSB

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA. CHAMBERSBURG-NATIONAL TIFFIN, OHIO CHAMBERSBURG, PA. Detroit, 2457 Woodward Ave Chicago, 565 W. Washington St. New York, 152 West 42nd St.



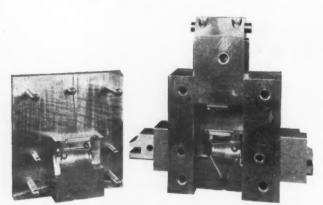
## ... Where Fine Workmanship and Sturdy Construction are Combined

The carburetor throttle body die shown here illustrates the combination of close workmanship and sturdy construction that makes the Madison-Kipp Die Casting Machine and Dies an outstanding combination for exact production of die cast parts.

This die was designed and built by the Madison-Kipp Corporation. In use, all movements of the die and cores are fully automatic, as are all operations of the Madison-Kipp Die Casting Machine.

This fully automatic operation also makes the Madison-Kipp Die Casting Machine the outstanding means of attaining high production and low cost in the making of die cast parts.

Information on the Madison-Kipp Die Casting Machine, or the Madison-Kipp service for the design and production of dies, will be sent to any engineer, operating official, or executive interested.



### MADISON-KIPP CORPORATION

DIE CASTING DIVISION
203 WAUBESA STREET, MADISON, WISCONSIN
Manufacturers of Air Grinders, Fresh Oil Systems, Mechanical Lubricators, Die Casting Machines, Die Casting Dies — See also pages 11-41

## Madison-Kipp DIE CASTING MACHINES

BLUF DISTONDANCE ON DISTONDANCE OF THE PARTY OF THE PARTY

**NEW RESULTS** 

No. 407B BLUE DIAMOND High Speed Wire Drills

## HIGH PRODUCTION LOW BREAKAGE

Beat your old production records with Blue Diamond High Speed Drills! • Improved design! Special heat treatment! These drills penetrate faster and reduce breakage to a minimum. • Used by the finest production shops to replace ordinary high speed drills on steel forgings, cast iron, cold rolled steel, brass, bronze, aluminum and alloyed metals. • On one job average breakage was reduced from 150 drills a day to six and production doubled. • On nitralloy pump shafts Blue Diamonds drilled seven times as many holes per grind as ordinary high speed drills. • Step up your production with Blue Diamonds!

Manufacturers of TWIST DRILLS · REAMERS · CUTTERS END MILLS · COUNTER BORES · ETC.



Canadian Factory CANADIAN DETROIT TWIST DRILL CO. LTD., WALKERVILLE ONTARIO

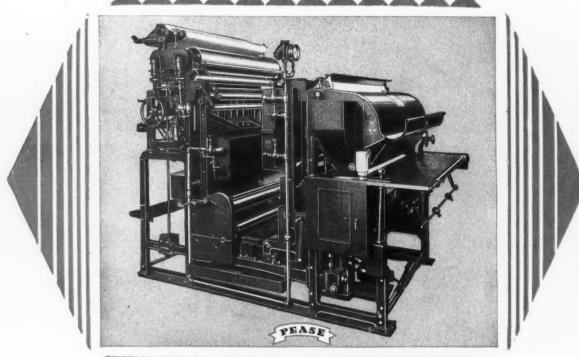
New York . DETROIT . . . Chicago

MAKERS OF FINE TOOLS FOR 76 YEARS

· Askvourlocal distributor for Blue Diamond High Speed Drills—in the yellow package

Furnished in Jobber's Sizes 1/16 to 1/4-in. and Wire Sizes to No. 55 · ·





## "30"

## INCOMPARABLE BLUE-PRINTS!

Also Negatives and Blue Line Prints, and Brown Line Prints Too!

HEN all is said and done...that's what you get with the new Pease "Peerless" Model "30" Blue-Printing Equipment... first class Blue-Prints, Negatives, Blue Line and Brown Line Prints... in continuous operation at lowest cost per square foot—and the machine has a speed range of from 4 inches to 12 ft. per minute.

You couldn't ask for more . . . and, of course, you wouldn't be satisfied with less. The finished product—Excellent Prints—tells the story of success for the new Model "30" Blue-Printing Machine.

Ask for Model "30" Brochure MP-22H

THE C. F. PEASE COMPANY 822 NORTH FRANKLIN STREET, CHICAGO, ILLINOIS

## PERASIE BLUE PRINTING MACHINERY

106-MACHINERY, August, 1930



120,000 of These from One Set of Chasers

Not a record, perhaps—but typical Geometric performance.

The piece — a nipple with a 3%" Straight Pipe Thread 15%" in length —is being threaded with highly satisfactory speed and precision with a Geometric 1" K Type Rotary Die Head. But the Miller Company (Meriden, Conn.), is especially enthusiastic about the economy of Geometric chaser production — and 120,000 of these nipples from one set is something to be enthusiastic about.

Geometric Threading Tools play no favorites—they'll be equally economical in *your* shop.

Write for complete details

THE GEOMETRIC TOOL CO.

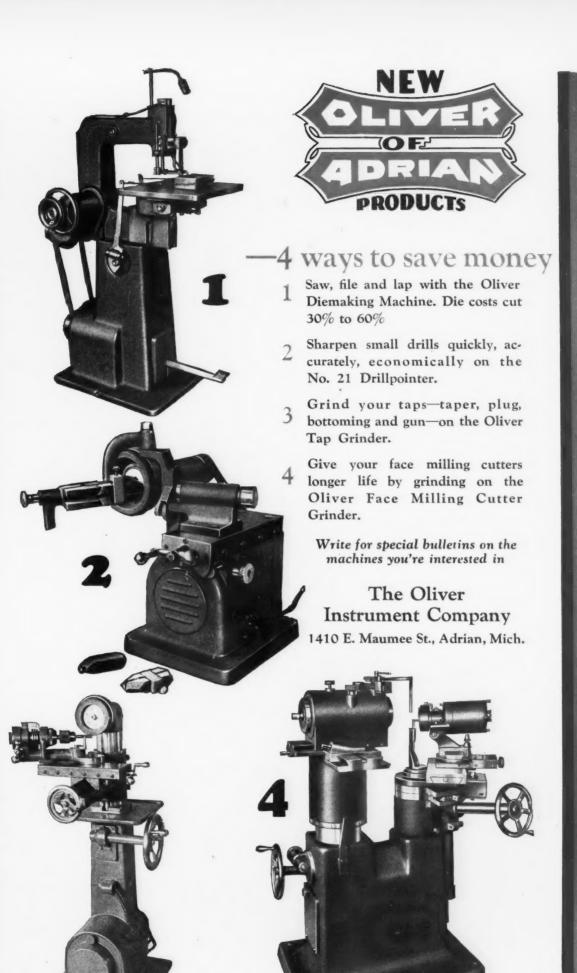
New Haven, Conn., U. S. A.





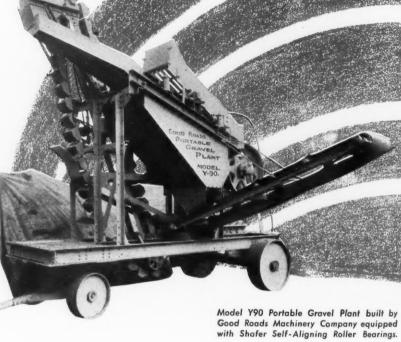
GEOMETRIC K TYPE ROTARY

108-MACHINERY, August, 1930





dirt, dust and rough service



EW contractors have time for more than the minimum of maintenance attention; no contractor has any patience with machinery that delays a job. Shafer Roller Bearings in the toughest construction machinery applications take this rough service and come back for more; save power, smooth out operations, and ask no odds from the user.

The exclusive self-aligning design of Shafer Bearings provides ample capacity for shock and thrust loads as well as radial loads. Shaft deflection or temporary misalignment cannot alter the load bearing areas or the free running performance of these bearings.

Maintenance is reduced and the bearings completely protected by the Shafer labyrinth grease seal. Oil cannot leak out nor dust and dirt penetrate, even if these bearings work in an atmosphere of abrasive dust.

More and more machinery builders are finding in Shafer Self-Aligning Roller Bearings the performance needed for the severest jobs. Write for data sheets and a full description of the Shafer exclusive features.

### SHAFER BEARING CORPORATION

6501-99 W. Grand Avenue, Chicago, Illinois BRANCH STOCK: 173 Lafayette Street, New York City

SHAFER BEARINGS ARE SELF-ALIGNING SELF-ALIGNING
ROLLER BEARING
INDUSTRIAL UNITS

## Planamilling Rear Axle End Holes

One Minute Each

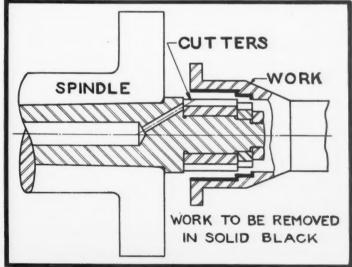
Here's another Hall Planetary operation of interest to the automobile manufacturer. We have previously told about Planamilling Rear Axle Central Holes in 5 minutes, floor to floor. This time we show Planamilling production on the two end holes.

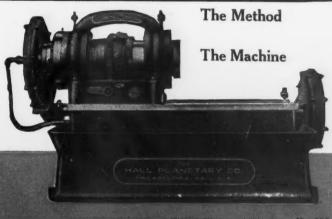
The operation proceeds as follows: — The axle, set up on a large plate and centered on a disc, is pushed over the cutters by an air cylinder. The cutters take first a roughing and then a finishing cut, removing 3/32" of metal. Tolerance on these bores is .001" plus and minus. The air cylinder then backs the housing away from the cutters, the operator turns it end for end and the operation is repeated. An air hoist then lifts the part from the machine and sets up another. Time for each hole is one minute and each axle housing weighs about one hundred pounds!

This is just another example of the extraordinary results automotive (and other) manufacturers are getting on the Hall Planetary Machine. Our new booklet, "The Planetary — What It Is Doing," shows an interesting sequence of profitable production operations. Write for it.



The Hall Planetary Co.
Fox St. and Abbotsford Ave., Philadelphia, Pa.







C-O 14" Sliding Head Bench Multiple Spindle Sensitive Drilling Machine

Two, three, four, five and six spindles with speeds or combinations ranging from 450 to 10,000 R.P.M. Individual motor drives, serviced universally.



## PRECISION BUILT--

The careful construction of Canedy-Otto "Precision Built" Drilling Units is reflected in the results obtained. Wherever used, C-O equipment has established enviable records for speed and accuracy; records that are particularly remarkable when its low price range is considered.

C-O Machines are "Priced for Your Profit"—well within the limits of the most modest shop. Nothing in their construction is omitted but the frills—the fancy talking points that keep prices up. You get the essentials for profitable and productive work—and at the rate we sell them, this is what industry wants. Ask for circulars and prices.

CANEDY-OTTO MFG. COMPANY Chicago Heights, III.

Consult Our Engineering Department on Your Drilling Problems Whether Regular or Special. All machines delivered "Ready for the Job"

# CANEDYOTTO DRILLING UNITS



## This is the SELLERS DRILL POINT



The Sellers Drill Point is ground as recommended by leading drill manufacturers. The Sellers Drill Point is, therefore, theoretically and practically correct.

This point is automatically duplicated on every drill ground on the Sellers Drill Grinder. It grinds each lip accurately, and automatically insures correct clearance

from center to circumference.

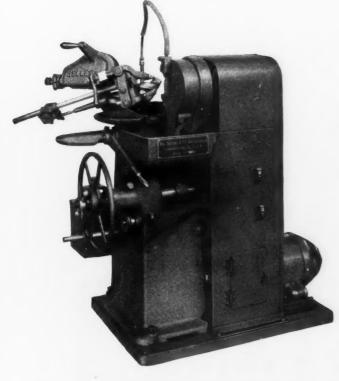
Any intelligent boy can operate the machine and turn out perfect, free-cutting drills.

The result is:

More holes per grind More holes per hour Less strain on machine tool Less power consumption

Let the Sellers Drill Point speak for itself. Send us six or more drills. We will sharpen them on the Sellers Grinder and return. them for comparison and test,

with no obligation.



THE SELLERS No. 2-A DRILL GRINDING MACHINE

WILLIAM SELLERS & COMPANY ESTABLISHED 1846 INCORPORATED

## Carbon Eutectic Castings

ALL Monarch Lathe beds are cast from an alloy containing from 75% to 80% steel—the balance being a special high-grade pig iron containing chromium and other elements. The photomicrographs below show the great difference in the grain structure of Monarch castings and those ordinarily used.

This alloy is also used for all Monarch carriages, compound rests and taper attachment parts. Monarch carriages, however, do not contain quite as high a percentage of steel as is put into the bed castings. Consequently, the beds are a trifle harder so that any wear occurring will be mainly on the carriage. The ways of a Monarch

Lathe bed will not wear hollow. The sliding surfaces retain their original accuracy an unusually long time.

Because of the extremely small percentage of



Figure A

### The Metal Structure of an Ordinary Casting

(Figure A)

This photomicrograph was made from a good grade of iron casting. It contains only 15% steel, the balance being pig iron. Note how coarsegrained, porous and open the metal is, Such castings have a Brinnel test of about 125 and are subject to blowholes and other defects. The heavy lines indicate Carbon spots. Such a casting is open and porous and will quickly wear. Castings of this quality are never used in Monarch Lathes.

### Write for the Facts!

The Monarch better lathe bed is completely described in Catalog No. 132. Write for your copy.



## Used in MONARCH Beds

carbon in Monarch castings, they are classified as CARBON EUTECTIC. This is considered practically the ultimate of perfection in castings for machine tool use. Because the carbon content is only 2.60% to 2.65%, such castings, when machined, have an extremely hard wear-resisting surface that is without equal.

Superior metal, combined with careful machining, makes Monarch Helical-geared Timkenized Lathes not only accurate in the beginning but insures retaining this perfect alignment throughout their unusually long life.

The photomicrographs below were made of small sections of castings magnified 100 diameters under identically the same conditions of light, camera extension, etc.

The camera shows a wide difference in the metal structure of Monarch castings and in that of ordinary castings.

### The Metal Structure of a Monarch Casting

(Figure B)

This photomicrograph was made from a sample of special alloy used in making castings for Monarch Lathe beds. It contains 75% to 80% steel, chromium and certain other elements that produce a very fine, close-grained casting—free from carbon spots and defects. Such castings machine perfectly to a faultless bearing surface. The Brinnel test averages 265 to 275—the tensile strength from 50,000 to 60,000 pounds.

The presence of free carbon in a casting causes porosity and defects so frequently seen in lathe bed castings. To those who understand metallurgy, the great superiority of the metal used by Monarch is obvious. In fact, the

ways of a Monarch Lathe bed have such an extremely smooth surface—free from imperfections—that they look like steel.

The Monarch Machine Tool Company SIDNEY, OHIO, U. S. A. New York Sales Office: 857 Graybar Building









Castings in which a percentage of Superior Charcoal Pig Iron is used, are stronger, denser, and tougher without corresponding increase in Brinell hardness. This promotes easier machining with better results—eliminating rejec-

tions due to hard spots or other physical structural

weaknesses.

The micrographs (in the circles above) tell why. The upper circle shows a micrograph of Superior Charcoal Pig Iron. Notice that the graphitic flakes are very small and nodular (knot or hook-shaped) in form. This structure provides greater strength. In ordinary pig iron (micrograph in lower circle) these flakes are coarse, large and straight,

contributing decided weak spots.

In Superior Charcoal Pig Iron both combined carbon and graphitic carbon are more firmly enmeshed, more evenly distributed and properly balanced. This imparts to the structure of castings better continuity of these elements, therefore greater transverse and tensile strength.

Such definite assurance of better quality and less rejections and losses far out-balances the slight additional cost in the cupola mixture (5c to 6c per 100 pounds for 20% Charcoal mixture).

Many other desirable qualities peculiar to Charcoal Iron Castings may prove advantageous to your product. Let us study your problem with you, to determine the advisability of using Superior Charcoal Pig Iron in your castings.

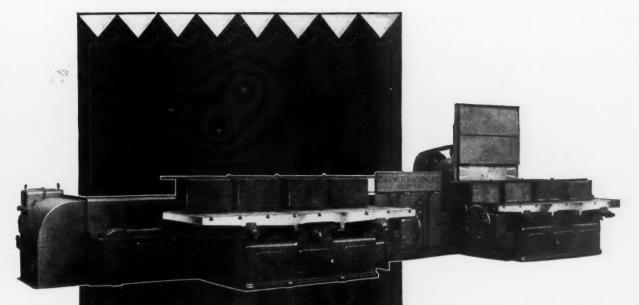


Write for a copy of the booklet, "Superior Charcoal Pig Iron,"
It gives the history, character istics, uses and grades of Superior Charcoal Pig Iron and contains other valuable information on iron castings.

### SUPERIOR CHARCOAL IRON CO. GRAND RAPIDS · MICHIGAN

DEBEVOISE-ANDERSON COMPANY, INC., Eastern Representative NEW YORK . . . BOSTON . . . PHILADELPHIA

116-MACHINERY, August, 1930



## PROOF of ability to build SPECIAL-PURPOSE Grinders!

THE mammoth machine illustrated here—a tool 35' long and weighing 35 tons—affords convincing evidence of the ability of Gardner Engineers to design and build SPECIAL-PURPOSE GRINDERS, regardless of how unusual may be the problem to be solved.

Developed especially to grind all six surfaces of large fire brick blocks used in lining glass furnaces, it is not only the largest Disc Grinder ever built, but it is a most effective and productive tool, as well.

Twenty-five years of experience in building standard Disc Grinding machinery, coupled with successful concentration on out-of-the-ordinary, single-purpose Flat Surface Grinders in the past half-decade, enables us to satisfactorily solve YOUR problem, whatever it may be!

Put your unusual grinding problems up to 'GARDNER'-



## GARDNE Specialists in Grinding Equipment MPANY

414 East Gardner Street

-:-

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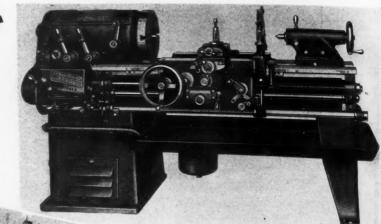
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Beloit, Wisconsin, U.S.A.

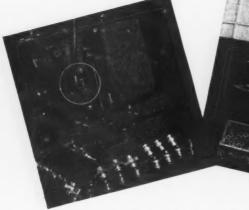
WRITE FOR 24-PAGE BOOKLET—
"ACTUAL APPLICATIONS"!

MACHINERY, August, 1930-117

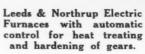
# Methods, Materials and Machinery that Assure QUALITY.



NEW MODEL REED-PRENTICE Sliding Gear Head Lathe.

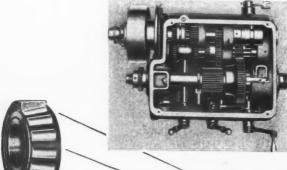


Latest type Fellows Gear Shapers for forming gears.

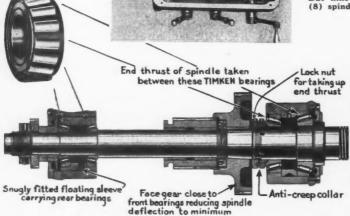




Heald Sizematic Internal Grinders for grinding gear holes from pitch diameter.



Headstock: Gears of Nickel Chromium S.A.E. 3250 Electric Furnace steel hardened to Rockwell test of C55-58. Gears slide on multiple splined shafts of heat treated high manganese and nickel chromium steels running in Fafnir ball bearings. But nine (9) gears for eight (8) spindle speeds.



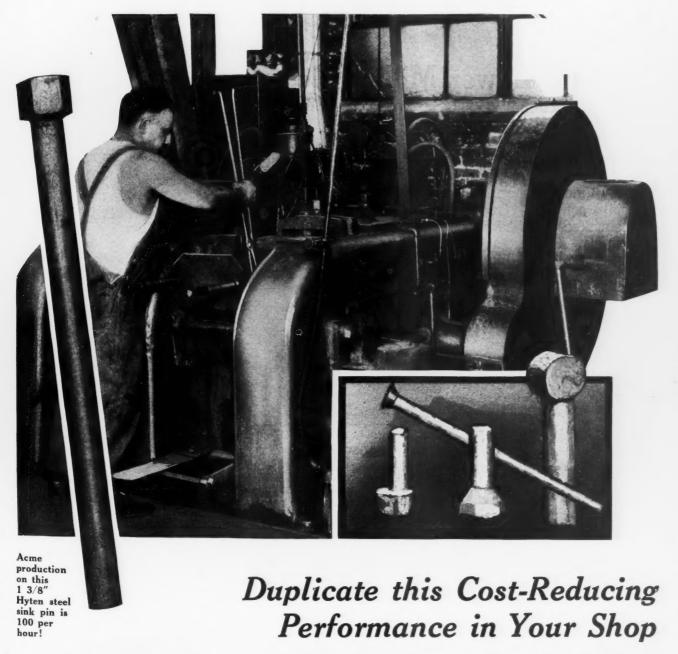
Spindle: Forging S. A. E. 6140 heat treated Chrome Vanadium alloy steel heat treated to Rockwell test of C-36 to 40, running in TIM-KEN Precision four-bearing mounting.

Cincinnati Shaper Co.'s burnishing machine for finishing gear teeth.



### REED-PRENTICE CORPORATION

Worcester, Mass., U.S.A.



### ACME FORGING MACHINES

Now is an excellent time to install improved equipment — replacement of obsolete machines with modern Acmes means big cost reductions! Write for details.

This large middle western manufacturer of gasoline shovels, ditchers, dragline buckets and cranes watches departmental costs closely! That's why you find three Acme Forging Machines on the job there. The forged parts illustrated (and many more) are being turned out at a cost per piece which you would agree is unbelievably low; die and maintenance costs are minimum. Here's why:

Acme Forging Machines have a higher capacity per heat; eccentric upsets, enlarged shanks, excessive flash and other common forging machine faults have been eliminated; Acmes are built to handle a wider range of work more economically. That Acmes produce a large share of all the country's forgings is convincing proof!

### The Acme Machinery Company

Cleveland, Ohio

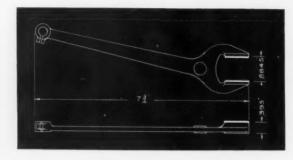
FOREIGN AGENTS: Burton, Griffiths & Co., Ltd., London. Glaenzer & Perreaud, Paris, France.

## Now!

### Still Lower Milling Costs

Manufacturers of milled parts, large and small, are finding new economy in Offset Milling. The Sewing Machine Feed Fork connection illustrated is an excellent example. An Offset Mill finish mills these forks on one side and on both inside faces at a cost per piece far below ordinary levels. In many instances jaws and cutters are the only "special" equipment required — another big economy, supplemented by still further savings in time, labor and floor space. A glance at the list of users below testifies to the economy of milling the Offset way!





### Sewing Machine Feed Fork Connection

Simple hand clamp fixture with work holding units at two elevations handles this part. Forks are moved from lower to upper stations for successive operations. Check, below, parts which interest you—write for figures. Or send your own blueprints for estimate.

### A Few Parts Being Milled the Offset Way

Articulator Rod Bearing Cap Bearing Adjusting Rings Brake Fittings Brake Shoe Link Commutating Poles Clamp Rings
Connecting Rod
Conveyer Belt Pin
Carburetor Parts
Differential Carrier
Emergency Brake Toggle

Connecting Link
Frame Hanger
H-Link for gas pump
Lever Shaft
Link
Plunger

Pulley Shaft Outer Pulley Shaft Inner Rocker Arm Spring Hanger Steering Knuckle Steering Segment Shifter Fork Valve Lifter Valve Lever Pin Support Wing Shock Absorber Wingshaft Shock Absorber Yoke

## () ESTERLEIN FFSET MILLS

OFFSET MILL USERS: A. C. Spark Plug Company, Wilson Foundry & Machine Company, Hudson Motor Car Company, Houde Engineering Corporation, National Acme Company, Nash Motor Company, Ford Motor Company, Wright Aeronautical Corporation, Budd Wheel Company, Studebaker Corporation, Ainsworth Mfg. Company, Chevrolet Motor Company, National Gauge & Equipment Co., and many others.



#### The No. 2 Oesterlein Universal Cutter and Tool Grinder

Versatile, dual controlled—saves a world of grinding time. Produces solid-backed cutting edge with double life of hollow one. Real tool economy! Get full data.

#### The Oesterlein Constant Speed Milling Machine

Incorporates Oesterlein V-Flat Overarm construction and many other praiseworthy features. Quick, easy arbor changes—more economical precision milling. Ask about this machine.



THE OESTERLEIN MACHINE CO., CINCINNATI, OHIO, U. S. A.

# A Swiss Jig Borer Job

30 Hours for This Work Locating—Drilling—End Milling. 320 Holes in 6 ft. Bronze Casting. Only Three Set-Ups Required

This part for a motion picture machine is typical of the work in the plant of H. O. Boehme, Inc., N. Y. City, manufacturers of electrical and mechanical instruments, etc.

This part is a box shaped hollow bronze casting 6" deep, 20" wide, 6' long; the metal through which the holes are drilled and finish end milled is 3'8" thick. All distances are located

on the Swiss Jig Borer without previous spotting or laying out and three set ups are required because of the unusual length of the work. Distances between centers vary, but all center distances are held to limits of + or - .0005", 106 of the holes range from 2- $\frac{3}{8}$ " diameter down to  $\frac{1}{4}$ "—limits in some cases are to + or - .0005", but most holes are held to + or - .0002". There are also 214 tap holes from No.  $\frac{6}{32}$  to  $\frac{1}{2}$ " taps. Floor to floor time for the entire job, 30 hours. Previous production time on this part was 70 hours.

Nielson Surveys on Swiss Jig Borers in well known plants will give you some idea of the range of application, and the savings possible with these machines.

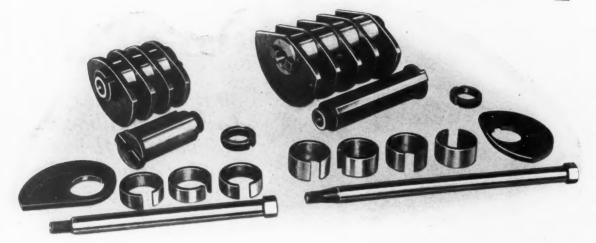
Two booklets—one of installation photographs, the other "Questions to Ask Before Buying a Jig Borer" are certain to interest you. May we send them?

### THE R. Y. FERNER COMPANY

UNITED STATES and CANADIAN AGENTS INVESTMENT BLDG., WASHINGTON, D. C.

REPRESENTATIVES—New York City: Triplex Machine Tool Company, 50 Church St. Detroit: Walter S. Ryan Company, General Motors Building. Chicago—Neff, Kohlbusch & Bissell, 806 West Washington Blvd. San Francisco: Joseph C. Fietcher, 661 Folsom St. Milwaukee: Neff, Kohlbusch & Bissell, 610 Michigan Ave.

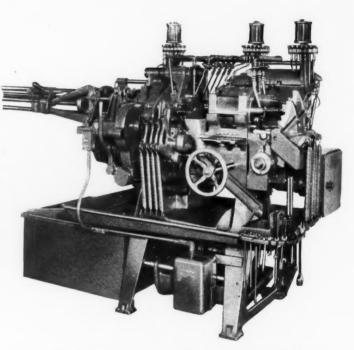
## The 3-Minute Set-Up



## It's All in the Cams

The speed with which a Davenport 5-Spindle Automatic can be set up lies in the cams. When the job is changed, its particular cams can be removed and cams for new work installed in three minutes; time that compares favorably with a single spindle machine's. Assembling the cams for a new job is quickly and easily accomplished while the machine is running on the work preceding it.

This sounds simple, and it is; but it is a feature exclusively Davenport, developed only after many years of constant effort toward greater convenience and lower adjustment. Just *one* important reason why Davenports are preferred by most leading producers of screw parts in quantity.



### Profitable, Too, On Small-Lot Runs

The New Davenport is, of course, primarily a high production machine. Yet, with its set-up speed and other outstanding convenience features, it is being profitably used in many plants on "small-run" work.

Tell us about your screw machine requirements—large or small—and let us show you with estimates that the New Davenport can produce cost reductions that you will be interested to know about

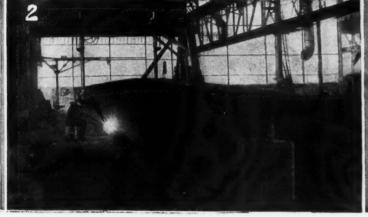


Automatic Screw Machine

DAVENPORT MACHINE TOOL CO.

ROCHESTER, NEW YORK





## Building Cranes with

### G-E Automatic Arc Welders

To MEET the increasing demand for its arc-welded cranes, the Cleveland Crane & Engineering Co. of Wickliffe, Ohio, installed two G-E automatic arc welders as shown above.

Fig. 1 shows the travel equipment which supports the welding generators, control panels, and automatic heads. Fig. 2 shows the equipment at work on an 86-ft. girder for a 10-ton crane. The equipment can lay a perfect weld 125 ft. long and at a speed of 32 ft. per hour.

After a year of successful operation, the manufacturer reports the following results: A lighter, stronger, simpler, more rigid product; increased production per unit of floor area; saving in time of designing and manufacturing; improved engineering; less waste material; increased productivity of operators.

Ask your nearest G-E office for further information concerning this installation and our complete line of automatic arc-welding equipment.



Close-up of one of the two automatic arc-welding heads

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

GENERAL



ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES



FOR years the 6 x 6 3/4 Goss & DELeeuw Automatic has been building up a reputation as a fast producer of accurate work and as a machine designed and built to reduce machine down-time to a negligible factor. Three years ago the 11 x 10 machine opened

up a new field of economies in large chucked work. Now the new size  $8\frac{1}{2} \times 8$ —identical in construction, but midway in size, capacity and price—fills in the gap.

Send for Detailed Specifications.

## GOSS & DELEEUW MACH. CO.



That Stands Out in Every Mark

Every mark made with a Thor Steel Marking Stamp reflects the accrued advantages of correct heat treating, better designing, special steel and hand engraving. They are cleaner, "prettier," more legible marks—enduring!

THE PITTSBURGH STAMP COMPANY

810 Canal Street, PITTSBURGH, PA. Steel Marking Stamps are important shop tools—they deserve the careful workmanship and superior materials that produce "Thors." You, the user, share the advantages of finer manufacturing—in a sweeping guarantee of better service—in more and finer marks per dollar.

Ask us for our new and interesting circular, "The Stamp With the Blue Head." It will give you a new slant on metal marking.





Starrett Vernier Depth Gage No. 448 — range 0 to 4 inches by 64ths and 1000ths.



Starrett Micrometer Depth Gage No. 440-range 0 to 3 inches regular round rods.



### STARRETT NO. 449

Starrett Micrometer Depth Gage No. 449—supplied with 3 rods, giving a range of 0 to 3 inches Blade can be turned at any angle with base, but only moves perpen-dicularly when measurements are being made.

Starrett Micrometer Depth Gage No. 449 has a thin flat rod. Less than 1/8" wide, only .040" thick, this rod gets into narrow slots and recesses that can be measured only with the greatest difficulty with other tools. It can be brought in direct, accurate contact with extremely narrow shoulders

Experienced machinists welcome this new gage. Especially valuable in checking jigs, fixtures and dies, it allows

Fiftieth Anniversary

them to obtain directly and quickly the measurements which formerly were hard to make with any accuracy whatever.

Starrett Gage No. 449, bringing Starrett precision to a difficult class of measurements, is only one of many new tools which are described, illustrated and priced in the new Starrett Catalog No. 25 "D". Have you received your copy of this book? Write, and we shall be glad to send it.

THE L. S. STARRETT CO.

World's Greatest Toolmakers Manufacturers of Hacksaws Unexcelled Steel Tapes - Standard for Accuracy

### of Starrett Tools 1880-1930 ATHOL, MASS., U. S. A.

A NEW



126—MACHINERY, August, 1930



**PLANERS** Open Side. Double Housing

BORING MACHINES MILLING MACHINES DRILLING MACHINES

HEAVY DUTY MACHINE TOOLS For Industrial and Railroad Shop Service

SPECIAL PURPOSE MACHINES

The speed of the cutter may be adjusted to the work at hand. Tooling up is done more quickly. Less power is consumed and the hazard of breakdown of power transmission units is enormously lessened. The machine maintains its accuracy—yet is flexible.

1 or 4 motor spindle speeds obtainable. Spindle speeds varied 25% up or down, through the medium of "pick-off" gears. Let us send you full information about this very efficient Putnam machine tool.

Manufactured at

PUTNAM MACHINE WORKS, Fitchburg, Mass. Owned by

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Chicago

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Representatives:

Arch Machinery Co.

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1005 Park Bldg., Pittsburgh, Pa.

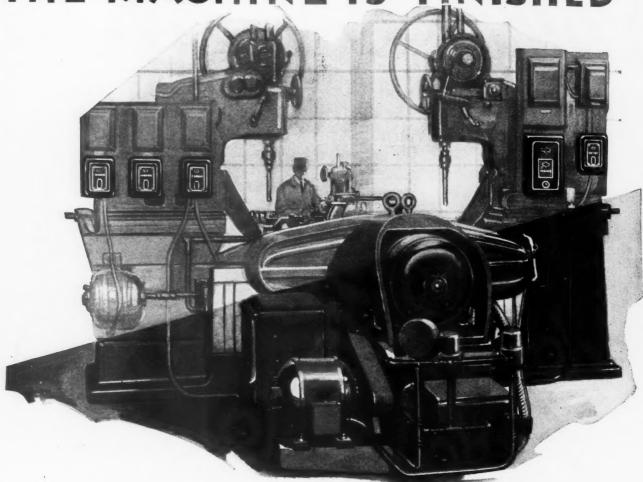
228 Central Ave., Los Angeles, Cal. Royal Bank Bldg., Montreal, Canada

MANNING, MAXWELL & MOORE, Inc.

MACHINERY, August, 1930—127

PROOF

THE MACHINE IS "FINISHED"



MOTOR-DRIVEN machine is "finished"—ready for today's production requirements, only when the motor is protected against all emergencies... only when it is both safe and convenient to operate... only when maximum production per day, per month, per year is assured by modern Motor Control.

The Cutler-Hammer trade-mark on the Motor Control of a motordriven machine is proof the builder has finished his job... that he has done his conscientious best to meet your production requirements regardless of cost. It is proof he knows the value not only of protecting motors but of protecting them accurately.

Use the Cutler-Hammer trademark on the Motor Control as a guide in selecting motor-driven machines. Use it for motors purchased separately; it is recommended by motor builders to guarantee satisfactory service to you and it is stocked by reliable electrical wholesalers in all important centers.

### CUTLER-HAMMER, Inc.

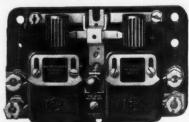
Pioneer Manufacturers of Electric Control Apparatus

1203 St. Paul Avenue MILWAUKEE, WISCONSIN

### MORE USABLE H.P.

The Cutler-Hammer Thermal Overload Relay protects motors so accurately against overloads that heavier loads are handled with safety. And its accuracy is permanent.

Nothing to replace after tripping . . . just press reset button to put motor back in service. It is used on the entire C-H Standard Line of Automatic Starters

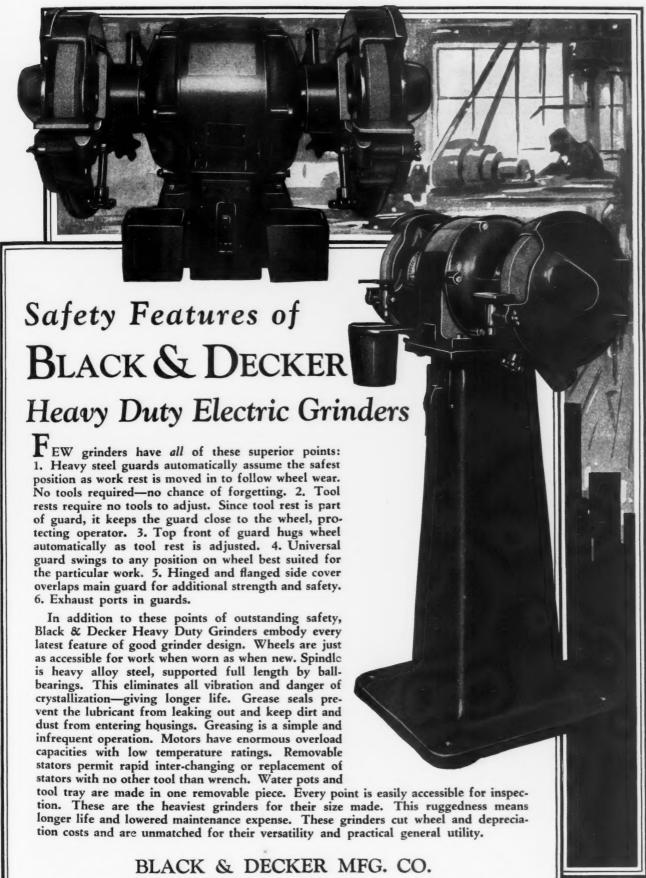


## CUTLER HAMMER

The Control Equipment Good Electric Motors Deserve

128-MACHINERY, August, 1930

CONTROL-



TOWSON, MARYLAND

Toronto, Ontario, Canada

Slough, Bucks, England

Sydney, Australia

### Now Production-Precision Grinding Has the Important Advantages of Norton Controlled Structure

ORTON Controlled Structure is a real achievement a real step ahead in grinding wheel manufacture. Regulating as it does the fifth variable\* it makes possible the fitting of wheels to their job and the duplication of wheels with an exactness far greater than ever before attainable.

These two features are of the utmost importance in modern high production, high precision grinding—such as crankshaft and centerless.

In controlled structure wheels not only the grain size and grade (bond strength) are regulated but also the size and number of the openings or pores between the grains. To do this it is necessary to control most accurately the amount of abrasive and of bond per unit volume. How carefully this is done can be appreciated from the fact that the variation in unit weight of Norton Controlled Structure Wheels is held within one per cent.

\*The five variables are abrasive, bond, grain, grade, and STRUCTURE.

### A Precision Machine Must Have Precision Built into Each Individual Part

NORTON GRINDING WHEELS AND MACHINES

NORTON precision could not be attained if there were even a slight error in any one or more parts of the Norton Grinding Machine. For precision work demands precision in the machine producing it.

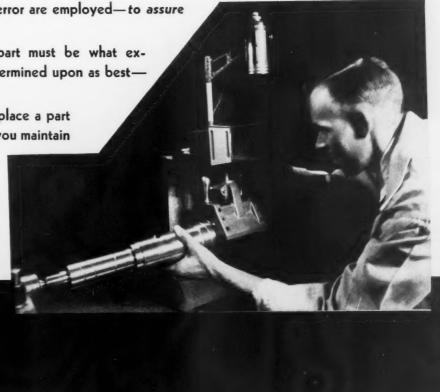
Accuracy measurement by ordinary precision instruments is not relied upon alone. Precision instruments which magnify many times the most minute error are employed—to assure Norton precision.

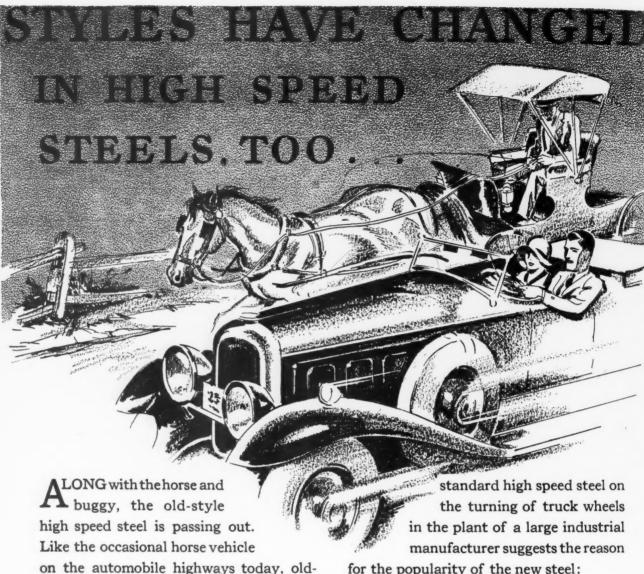
The material used in every part must be what experience plus research has determined upon as bestfor Norton precision.

Should it be necessary to replace a part in a Norton Machine be sure you maintain

"Norton precision"and Norton-made parts are certain to do so.

NORTON COMPANY WORCESTER, MASS.





Since CIRCLE C, the foremost of the super high speed steels was introduced about three years ago, the change-over to this new type has been rapid throughout industry. The following typical comparison between CIRCLE C and a well-known

fashioned high speed steel holds up the whole line. This is clearly the day of

SUPER HIGH SPEED STEEL.

for the popularity of the new steel:

	Standard High Speed Steel	Circle C
Feed	.068"	.083"
Speed (F. P M.)	175	352
Depth of Cut	1/4"	1/4"
Number Pieces Per	Grind 1	7

Whether your program be retrenchment or expansion, it will pay you to give CIRCLE C a trial.

Drills made of CIRCLE C HIGH SPEED STEEL may be obtained from the MORSE TWIST DRILL & MACHINE COMPANY, New Bedford, Mass.

## FIRTH-STERLIN STEEL COMPA

SHARPSBURG, PA NEW YORK BOSTON PHILADELPHIA HARTFORD LOS

# A COMPLETE LINE "LOGAN"

Greater Simplicity
for Greater Efficiency

Logan Line of Air Operated Chucks about boil down to thistheir simplicity is amazing. Machined from a one-piece electric steel crying, the number of parts is reduced to a minimum, and as there are no bolts, screws or joints in the body, there is nothing to work I see, and one of the principal cares of vibration is automatically liminated.

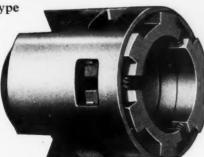
and reduced weight and activity reduces maintenance costs hale it permits heavier cuts and increased feeds.



Two-Jaw Type

Logan Air Operated Equipment includes Cylinders, Control Valves, Arbor Presses, Vises, as well as a complete line of chucks—and Special Devices or adaptations can be built by experts to meet your special needs.

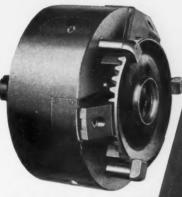
Use the coupon to obtain your copy of this new 64-page catalog.



Improved Collet Type



Thin Body Universa Type



Special Chucks of All T



#### THE LOGANSPORT MACHINE CO., Logansport, Indiana

Please send me my copy of your New Catalog S-25.

Name.....

Firm....



This new book of 536 pages contains illustrated descriptions of a large variety of standard and special mechanisms selected by experienced machine designers as outstanding examples of clever mechanical movements. Many of the most unusual and ingenious mechanisms ever devised are described and illustrated in this treatise. More than three hundred line engravings are used throughout the book to clearly illustrate the arrangement of the various mechanisms and the descriptions are right to the point and easily mechanisms, and the descriptions are right to the point and easily

In describing this book we want to avoid extravagant claims, but believe that designers of automatic machines will agree after examination that this treatise on ingenious mechanisms is by far the greatest work of this kind.

THE WORK OF 110 DESIGNERS There are two main reasons why Ingenious Mechanisms for Designers and Inventors is unparalleled—it is the work of 110 experienced designers and engineers located throughout the world, and the particular mechanisms described and illustrated have all been submitted to the publishers as exceptionally fine examples of well designed movements. Results which at first thought might appear to be impossible often are obtained mechanically by very simple, direct forms of mechanisms such as are described in this book. Practically every mechanism included embodies some idea or principle which may be adapted to various purposes.

# A COURSE IN MECHANICAL MOVEMENTS

This new book will enable any designer or draftsman to acquire easily an expert knowledge of the general subject of mechanisms.

# The Most Complete Work of its Kind

# The Work of 110 Experienced Designers and Engineers Located Throughout the World

The descriptions and illustrations are confined to the important elements or units in automatic machine design, so that time is not wasted in reading about a lot of useless uninforming detail. For example, in the chapters dealing with intermittent motions, stop mechanisms, reversing mechanisms, overload relief mechanisms, interlocking devices, speed-changing mechanisms, and so on, the descriptions relate only to the actual devices or units which perform these different functions. You are told plainly and briefly just what each mechanism does and how it operates. These various unit mechanisms or mechanical devices have actually been applied to a great many different types of automatic machines and other mechanical appliances, and this book provides a very complete course of study.

# PRIZE-CONTEST MECHANISMS

The publishers have been collecting material for more than fifteen years for Ingenious Mechanisms. To assist in this work, prize competitions have been conducted in connection with MACHINERY, thus reaching many designers both here and abroad. This new book also contains the best of the matter from our former treatise, Mechanisms and Mechanical Movements, to insure completeness and include many classes of mechanisms which belong in a work of this kind. All of the mechanisms described are grouped, as far as possible, into chapters according to general types, which, in addition to the complete index, greatly facilitates finding whatever class of mechanical movement is desired. This arrangement also brings together many mechanisms which are alike as to function and purpose but differ entirely in design; consequently, such mechanisms may readily be compared.

#### Some of the General Subjects Covered by this New Book

CAMS AND THEIR APPLICATION INTERMITTENT MOTIONS FROM

RATCHET GEARING INTERMITTENT MOTIONS FROM GEARS AND CAMS

TRIPPING OR STOP MECHANISMS
ELECTRICAL TRIPPING

REVERSING MECHANISMS FOR

OVERLOAD RELIEF MECHANISMS AND AUTOMATIC SAFEGUARDS INTERLOCKING DEVICES

DRIVING MECHANISMS FOR RECIPROCATING PARTS QUICK-RETURN MOTIONS FOR

SPEED-CHANGING MECHANISMS DIFFERENTIAL MOTIONS STRAIGHT-LINE MOTIONS

MISCELLANEOUS MECHANICAL HYDRAULIC TRANSMISSIONS

FOR MACHINE TOOLS AUTOMATIC FEEDING

MECHANISMS DESIGN OF AUTOMATIC FEEDING HOPPER DESIGN FOR AUTOMATIC

MACHINERY MAGAZINE FEEDING

ATTACHMENTS FOR MACHINE

DESIGN OF MAGAZINE CARRIERS AND SLIDES

#### THE INDUSTRIAL PRESS, 140-148 Lafayette St., New York City.

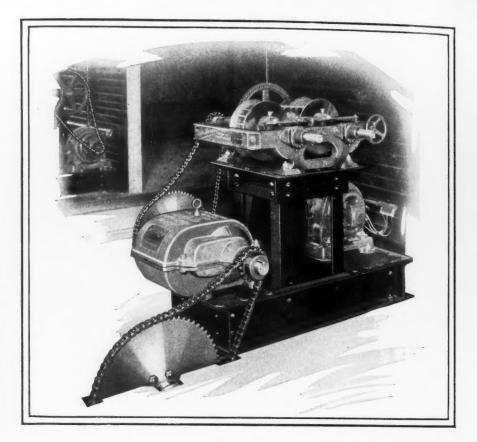
Price \$500

Send me a copy of Ingenious Mechanisms for Designers and Inventors-Price, \$5.00. I enclose \$2.00—initial payment—the remainder payable at the rate of \$1.00 a month for three months. Or I enclose \$5.00, payment in full.

Name

Address City and State Type of Baldwin Chain used in Automobile Plant





# They Specified "BALDWIN"

This conveyor drive is in an automobile plant where *uninterrupted* production and assembly depend on its operation. It *must* be *dependable*. The management specified Baldwin Chain.

More Baldwin Roller Chain is sold each year, as engineers and designers realize that the many advantages of roller chain drives are always present in Baldwin Chains and Sprockets.

Every Baldwin Chain is machine finished. Selected alloy steels, plus modern heat treating, provide a tough core and flint-hard surface to each wearing part. Pins and bushings are ground to exact size after hardening.

Equally important, Baldwin service is *complete*. Roller chains, block chains, special chains, conveyor chains, sprockets, and above all, a skilled and experienced engineering service to help designers select the best chain for every job. Ask for catalog H.

## BALDWIN-DUCKWORTH CHAIN CORPORATION

BALDWIN DIVISION

WORCESTER, MASS., U. S. A.

Pittsburgh Office: Room 720 Highland Bidg.

549 Randolph St.

Lyman Tube & Supply Co., Ltd.

Montreal Toronto Winnipeg

# BALDWIN DUCKWORTH

# "GIANT" Keyseating

Fast Work in Spite of Difficult Material

This worm gear for an automatic is of bronze-tough, stringy, slow cutting metal; the keyway is 3/8" by 3/16" by 2" long; production time, 8 minutes.

GIANT Keyseater ability to maintain accuracy and a high rate of production on a wide range of work, makes it a profitable installation in all classes of plants. The machine shown is giving a very satisfactory account of itself as a constantly busy production unit on tools, dies and special machine parts in a well known New York contract shop.

GIANT Keyseaters in 8 sizes cover keyseating needs in the tool room, machine shop, on contract work. May we tell you about them?

# MITTS & MERRILL, 843 Water St., Saginaw, Mich.

EXCLUSIVE DOMESTIC DEALERS

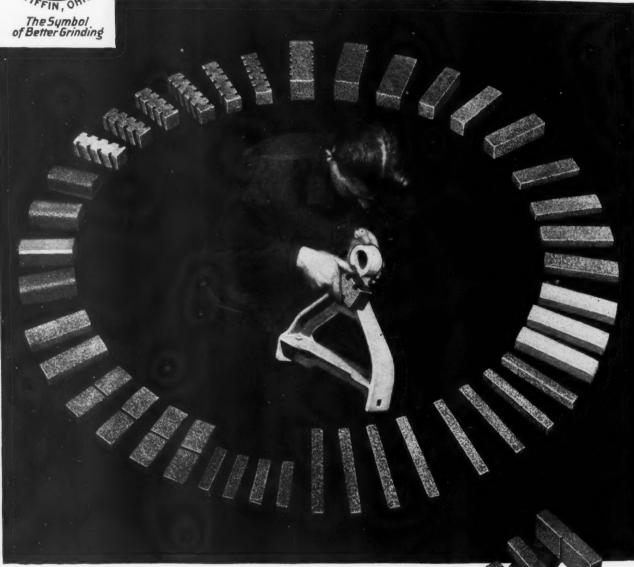
Brown & Zortman Mchry. Co., Pittsburgh, Pa. The E. L. Essley Mchry. Co., Chicago, Ill. Strong, Carlisle & Hammond Co., Cleveland, Ohio. Herberts Machinery Co., Ltd., Los Angeles, Calif. Herberts-Moore Mchry. Co., San Francisco, Calif.

FOREIGN AGENTS

Burton, Griffiths & Co., London, England. Aux Forges de Vulcain, Lyons and Paris, France. V. Lowener, Oslo, Norway and Stockholm, Sweden.



# ABRASIVE RUBBING BRICKS AND STONES



STERLING abrasive rubbing bricks and stones for scouring castings and chilled iron rolls, smoothing marble and granite or rubbing down stone and concrete are produced each with its definite purpose. Continuous experimenting by Sterling engineers assures you of a brick or stone that is made to give efficiency.

THE STERLING GRINDING WHEEL CO.

Abrasive Division of The Cleveland Quarries Co.
Factory and Office, TIFFIN, OHIO Branch at 23 So. Jefferson St., CHICAGO

Sterling combination penknife sharpener and speed indicator free upon request

STERLING ABRASIVES



OTHER OLSEN PRODUCTS

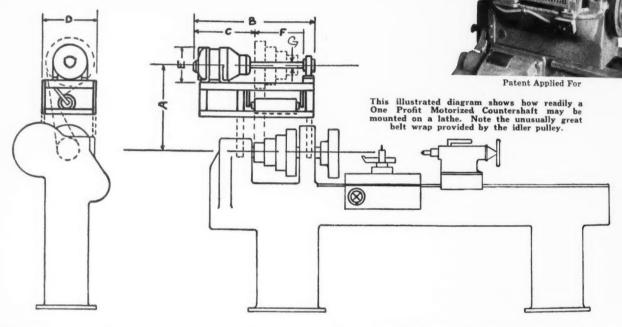
Olsen-Lundgren Centrifugal Dynamic Balancing Machines, Olsen Static - Dynamic Balancing Machines, Olsen Production Type Motor Driven Brinell Hardness Testers, and Testing Machines for All Industrial Materials. Olsen Testing and Balancing Machines for all industrial materials make it possible economically to insure quality and accuracy in every phase of production. Send for details of the Olsen Automatic and Autographic Universal Testing Machines and the rest of the Olsen Line.

TINIUS OLSEN TESTING MACHINE CO. 500 North 12th St., Philadelphia, Pa.

OLSEN

MACHINERY, August, 1930—139

# Mount a Motorized Countershaft on Every Machine Tool in Your Plant



WITH One Profit Motorized Countershaft equipped machines, overhead line shafting and expensive group drives can be eliminated, maintenance expense reduced, power conserved, production increased and quality of work improved, which are definite economies that promptly repay the installation cost.

Machine tools which have been labeled "obsolete" because of their belt drive, have a new lease on life and can be made as modern in operation as the newest machine in the plant. The highly efficient flexible leather belt drive of the motorized countershaft with its unusually great belt wrap, secured by a ball bearing mounted idler pulley, delivers a smooth flow of power which increases the machine's production and improves the quality of the work.

Conveniently located push button control places machine operating responsibility on each operator and allows concentration on the work in the machine. Individual motorization permits placing the machine at any angle to other machines on the floor or in any position along the production line. Ready to operate simply by connecting the motor to the nearest power line.

The primary motor drive can be furnished with either constant speed or multi-speed alternating current motors and suitable control. Standard integral planetary gear reduction units provide a countershaft speed as low as 50 RPM or as high as 550 RPM.

One Profit Motorized Countershafts are of practical construction, designed to modernize all cone pulley driven machine tools. They are built complete (motor, integral gear reduction unit, idler pulley, belt shifter, box type base, protective screens) in one plant and sold at a One Profit price through machinery supply dealers in principal cities who can effect prompt delivery.

THE PRODUCTION EQUIPMENT CO. 5219 WINDSOR AVE. CLEVELAND, OHIO

# ONE PROFIT Motorized Countershafts

# "That's a flexible shaft job"



"THIS tricky drive has pretty near got you stumped, John," continued the development engineer.

"Sure, you can put a couple of bevels on it, or get around it by some such stunt, but that means more bearings, more friction, more noise, and another point for trouble to develop. Put a flexible shaft on there and keep out of trouble, besides cutting the manufacturing cost on the job."

The chief draftsman was doubtful. "I don't think we can get a flexible shaft that would carry the load—"
"We can't, hey!" broke in the D. E. "We

can get them with twice that drive capacity, if necessary. And they certainly cut all the grief out of a problem like this. I'll lend you my copy of the flexible Shaft Handbook. Check up on it yourself, and without question you will agree with me that in putting a flexible shaft at that point we can save ourselves a whale of a lot of trouble and expense, besides making a much more saleable product."

Machine designers everywhere are daily finding new profitable uses for the flexible shaft, giving not only an easy solution to old problems, but enabling a new freedom in basic design, a sweeping down of past prejudices and limits. Write for the Flexible Shaft Handbook, and get the facts on this latest development in machine design.

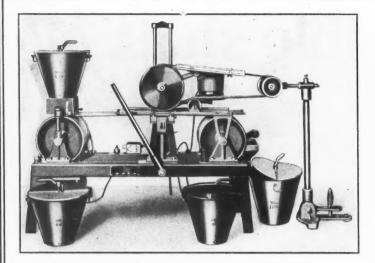
#### ... FREF to Engineers and Désigners

To any engineer, machine designer or executive responsible for machine design, a copy of this valuable 120-page handbook will gladly be sent without charge or obligation. We make only this reasonable condition: that your request be made on your business letterhead and that you indicate your position.

Write now for your copy.

The S. S. WHITE Dental Mfg. Co. INDUSTRIAL DIVISION 150 West 42nd Street New York, N. Y.





Cut wheel and Abrasive belt costs with a Scovil. Send for details of this important polishing department equipment.



106 Whitesboro Street

Chicago: Crown Rheostat and Supply Co.
, Detroit: Alfred T. Wagner
Cleveland: General Supply Co.

## SCOVIL HEADING MACHINES

For Better Service from Abrasive Belts

Easily set up for renewing Abrasive Belts, the Scovil Heading Machine makes it possible to keep them "right" — insuring more consistently efficient service and greater length of life.

The Scovil Heading Machine makes it possible to maintain abrasive surfaces uniform and true—it enables the polishing department to keep wheels and belts operating at maximum efficiency with minimum cost for reheading and renewing.

Strength



Durability

That's What You Get in "STRAND" Flexible Shafts and Equipments

Vertical Types

Type MS4—1/4 H.P.





Send for the Largest Catalog ever Issued Illustrating Flexible Shafts and Equipments

N. A. STRAND & COMPANY

5001-5009 No. Lincoln St. CHICAGO



## Ever Hear of Such a Thing as-PROFIT INSURANCE?

Last year you realized a certain profit on each unit of production. The question to consider now is: "Will it be possible to show a profit increase on each unit of this year's production?" In all probability it will—if you install HASKINS FLEXIBLE SHAFT EQUIPMENT.

Haskins brings you hand-tool flexibility with power. You lose nothing in skill or dexterity, but you do gain tremendously in speed and power. Your men, liberated from irksomely-slow hand work, do more in less time, and each job bears the indubitable stamp of quality. Is not this, in the last analysis, profit insurance?

Haskins Equipment is adaptable to almost every manufacturing process. Plants large and small are using Haskins tools for such operations as filing, grinding, polishing, sanding, scraping and brushing. Their users number thousands, and they represent a true cross-section of Industrial America's most progressive manufacturers.

> A Haskins catalog is yours for the asking. Where do you wish your copy sent?



# Portable Flexible Shaft Machinery

4634 W. FULTON ST. CHICAGO, ILL.

Branch Offices in Principal Cities

Branch C. ..

Floor Type

Equipment



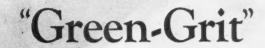
# ARTER ...

## No. 132 Automatic Cylindrical Grinder



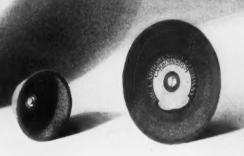
#### ARTER GRINDING MACHINE COMPANY

15 Sagamore Road, WORCESTER, MASSACHUSETTS



A NEW WHEEL FOR GRINDING TUNGSTEN CARBIDE INTRODUCED TO INDUSTRY BY

Carborundum
REG. W. S. PAT, OFF.



HE research and resources of The Carborundum Company have combined in producing this new wheel for grinding tungsten carbide tools.

It is known as the "Green-Grit" Wheel-

A free, clean-cutting wheel-

A wheel that has all of the qualities necessary for the grinding of this sensational new material.

The secret of the success of this new improved wheel lies principally in the fact that it is made from specially developed Carborundum Brand carbide of silicon crystals, bright green in color. It is a known fact that these green-colored crystals are sharper—are slightly more friable. Ideal for the particular work of grinding tungsten carbide.

Scientifically bonded, they have given us a wheel that keeps sharp—that really penetrates—that readily solves the problem of grinding all brands of tungsten carbide.

A Trial will Prove the Unprecedented Efficiency of this New Wheel

# The CARBORUNDUM Company

NIAGARA FALLS, N.Y.

Canadian Carborundum Co., Ltd., Niagara Falls, Ont.

Sales Offices and Warehouses in

Carborundum is the Registered Trade Mark of The Carborundum Company for its Products

New York: Chicago: Boston: Philadelphia: Cleveland: Detroit: Pittsburgh: Cincinnati: Milwaukee: Grand Rapids
The Carborundum Co., Ltd., Manchester, England Deutsche Carborundum Werke, Dusseldorf, Germany

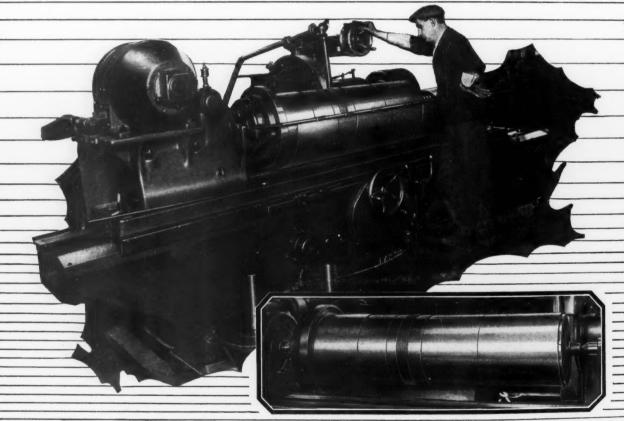
MACHINERY, August, 1930—145

# MICHINE TOOL BUILDERS PLEASE READ

Now is the opportune time for machine tool builders to put their own house in order.

The great activity of the last few years has rather naturally delayed the replacement of much obsolete equipment. It has been feared that replacements might cause a serious, even though but temporary, set-back in production schedules.

With conditions somewhat altered at the present time what is more logical than the replacing of that costly obsolete grinding machine with a modern Landis hydraulic. Many machine tool manufacturers are now taking advantage of the opportunity for they know that they will then be better able to meet competition during the next period of increased activity.



GRINDING A LARGE TURRET LATHE SPINDLE ON A LANDI 20"X 72" TYPE B PLAIN HYDRAULIC

-63

LANDI/ TOOL COMPANY

DETROIT CHICAGO WAYNESBORO, PA. NEWARK PHILADELPHIA

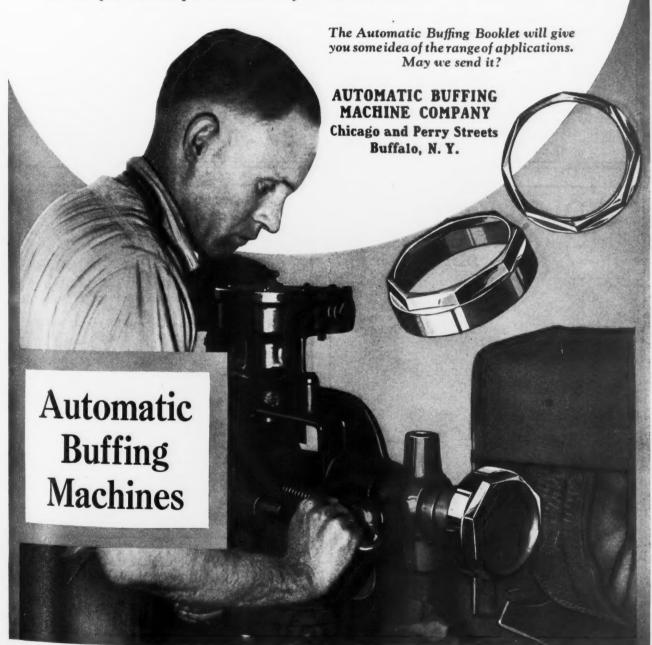
146-MACHINERY, August, 1930

## Reciprocating Action and Manifold Adjustments Particularly Advantageous in Buffing Clock Cases

It is the unusual scope and broad adaptability of Automatic Buffing Machines that make them so successful in quantity buffing and polishing and these are the features most appreciated at the Sessions Clock Co., Forestville, Conn., where these photographs were taken.

The operation shown is buffing brass alarm clock cases before plating; production—two operations on two Automatic Buffing Machines requiring only one operator—averages about 110 pieces per hour.

Automatic Buffing is without doubt the modern and efficient method of handling this or any other class of work to which it is applicable. You can't buff everything "Automatically" but you can buff an amazing variety of large and small parts and Automatic Buffing Engineers are at your service to advise you on the production possibilities in your line of work.



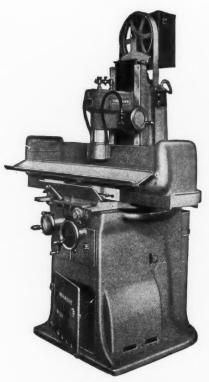
# ABRASIVE

No. 33 VERTICAL SPINDLE SURFACE GRINDER

An excellent and speedy method of reducing stock from most flat surfaces. The only method on some surfaces.

Write us for particulars

Abrasive Machine Tool Co.
East Providence, R. I.



No. 33 Surface Grinder 22" x 7" x 12"

#### **DUPLEX "M"**

#### Abrasive Band and Disc Grinder

A straight grain finish—rough, smooth or fine—can be produced with this handy machine by rough grinding on the disc and finishing on the abrasive band.

It accelerates production and shaves finishing costs on metal, wood and composition



Details of this and other styles and sizes on request.

WALLS SALES CORP.

96 Warren St., New York.

#### Bridgeport Hydraulic Face Grinders

Features Include:

"Timken" equipped spindle
"Oilgear" work table traverse
Instantaneous wheel dresser
Table speeds up to 85 ft. per minute
Circulating lubrication

Bridgeport Grinders are powerful, rigid, accurate; capable of maximum economy. Take 26", 32" or 42" Bridgeport "Shear Cut" Grinding Wheels.

The Bridgeport Safety Emery Wheel Co., Inc. 1283 West Broad Street, BRIDGEPORT, CONN.



#### **EmeryWheel Dressers**

Two Size

**CUTTERS** 

Nos. 1-2

We make the regular Huntington (Pattern) for all sizes. Roughing for Nos. 1 and 2. Paragon for No. 1 only.

GEO. H. CALDER CO., Lancaster, Pa., U.S.A.



DUMORE REG. U. S. PAT OFFICE

HIGH- GRINDERS

PRODUCTION POLISHING AND FINISHING MACHINES

For Polishing or Finishing tapered or cylindrical work in metal, wood, hard rubber, bakelite or any other hard surfaced material to 6" diameter, for producing any quality of finish desired at minimum cost.

The continuous centerless feed carries the work in a steady stream across the polishing belt; adjustments for varying diameters are quickly and easily made; quality of finish is controlled by the grain and grade of the polishing belt.

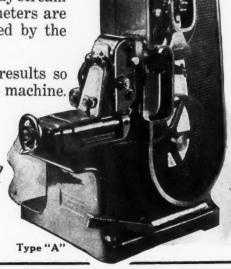
Production Polishing and Finishing is so simple, the results so dependable that an expert is not required to operate the machine.

Send us samples to polish for you—let us send you details of the machine.

#### PRODUCTION MACHINE COMPANY

GREENFIELD, MASS., U.S.A.

Motch & Merryweather Machinery Co., Cleveland, Pittsburgh, Cincinnati, P. A. Koerber, 565 W. Washington Blvd., Chicago, Ill. The Chas. A. Strelinger Co., Detroit. Smith Booth Usher Co., Los Angeles. Herberts-Moore Machinery Co., San Francisco.



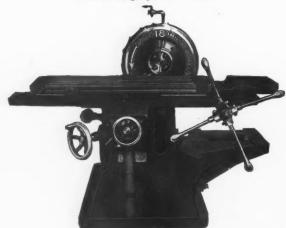
# GRINDERS

TWO SIZES

12" -- 18"

HIGH GRADE

For rapid production of flat surfaces that will be straight from end to end



18-inch Grinder Showing Motor Bracket. Water Guard Omitted.

You can readily fasten stationary, rotary or magnetic holders on the table to suit your particular case

ADAPT AND USE AS A BASE

A good example is our PULLEY GRINDER on which we have special circulars.

#### THE GRAHAM MFG. CO.

71 Willard Avenue Provide

Providence, R. I.

Great Britain-Richard Lloyd & Co., Ltd., Birmingham France, Italy, Switzerland, Spain and Holland-Fenwick, S. A

#### Grinding Wheel Dressers



#### The Desmond Diamo-Carbo Dresser

The best all-around Tool Room Dresser. The steel tube is filled with an extremely hard abrasive which is very durable and economical.

Desmond-Stephan Mfg. Co., Urbana, Ohio.

Canadian Desmond-Stephan Mfg. Co., Ltd., Hamilton, Ontario

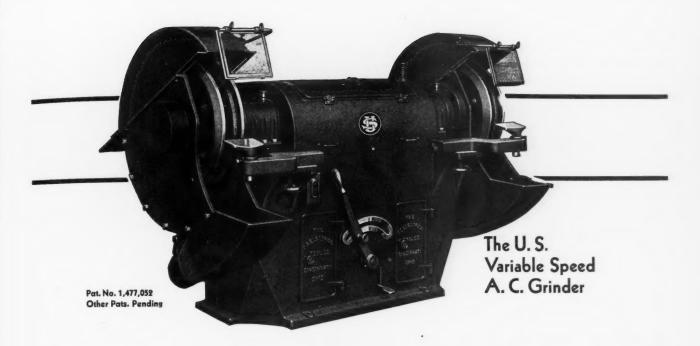
#### Profiling, Die Sinking Engraving Machines

Recently redesigned for greater production, greater range, greater profits. Send for details.

GORTON RACINE.WIS., U.S.A.

GEORGE GORTON MACHINE COMPANY, Racine, Wisconsin





# NO OTHER LIKE IT!

# It's Patented!

ALL THE BIG, new advantages of grinding with Gibbs V-Disc Transmission are obtainable only in this machine. This is because this feature is patented. Here are a few of the big advantages:

You can grind on alternating current. You can maintain a constant wheel surface speed regardless of wheel wear—and use the wheels clear down to the flanges. This is possible even with high speed wheels turning approximately 9,000 surface feet per minute.

The U. S. Variable Speed A. C. Grinder embodies all the advanced features of U. S. construction: SIX heavy duty SKF Ball Bearings in dust-tight housings. Heavy 1-piece chrome-manganese steel shaft. Powerful motor built to A. I. E. E. standards, rated for continuous service with temperature rise of 40 degrees, etc., etc. And—this is important—this grinder is built in accordance with the Safety Code of American Engineering Standards Committee, Bulletin 436 of the U. S. Bureau of Labor Statistics! Built in four wheel sizes.

YOU WILL DOUBTLESS WANT TO KNOW ALL ABOUT THIS GRINDER EVEN IF YOU ARE NOT BUYING. ASK YOUR JOBBER OR WRITE US TODAY



## The Drive

The Gibbs V-Disc Transmission is made of GRAPHITIZED MICARTA and has never been used in grinders before, although it has been employed successfully in other types of machines for years.

It shows highest efficiency in power transmission—is dependable and positive in action—will not slip—is free from back lash—readily accessible—quiet—durable—low in replacement cost—easy to operate—and economical. Fully guaranteed.

This drive is also obtainable in U. S. Multispeed Buffing and Polishing Machines—providing four different wheel speeds from 2,000 to 3,000 r.p.m. Built in five sizes. Get full details.

THE GOOD MECHANIC'S CHOICE SINCE 1897

#### THE UNITED STATES ELECTRICAL TOOL CO.

Oldest Builders of Electric Drills and Grinders in the World 2477 WEST SIXTH STREET, CINCINNATI, OHIO, U. S. A.

Atlanta, Boston, Chicago, Cleveland, Dallas, Denver, Detroit, London, Minneapolis New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Syracuse

Export Sales Representatives—WESTINGHOUSE ELECTRIC INTERNATIONAL CO.—150 Broadway, New York City

Canadian Division—MAPLE LEAF ELECTRIC TOOLS, Ltd.—Toronto



MACHINERY, August, 1930—151

Grind Tungsten Carbide Tools without burning!

These new Special Bonded CAR-BORITE Wheels do the Trick

A free, cool cut; a keen, lasting edge—those are the results when you grind Tungsten Carbide Tools with CARBORITE Special Bonded Wheels.

CARBORITE Wheels solve the problem of "hard tool" grinding, bring its cost down to a reasonable level and insure greatly improved grinding results. Ask about these new wheels today!

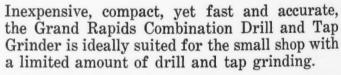
VITRIFIED WHEEL CO. Westfield, Mass.

Are you familiar with the new BORITE BAKELITE HIGH SPEED WHEELS for Foundry and Steel Mill use? Our Sales Engineers are at your service.

# Ideal For

For the

## "One Grinder" Shop



A skilled operator is unnecessary to produce grinding results infinitely better than any obtainable by hand grinding methods. The Grand Rapids Combination Machine grinds taps and drills *correctly*—your tools will last longer, cut better and cost far less if properly ground on this machine.

Also capable of high production work. Write for complete description.

#### GALLMEYER & LIVINGSTON CO.

344 Straight Avenue, S. W., Grand Rapids, Mich.
Export Department: 233 Broadway, New York City

# GRAND RAPIDS COMBINATION DRILL AND TAP GRINDERS



#### NEW GRIP FOR SLIPPING MOTOR BELTS

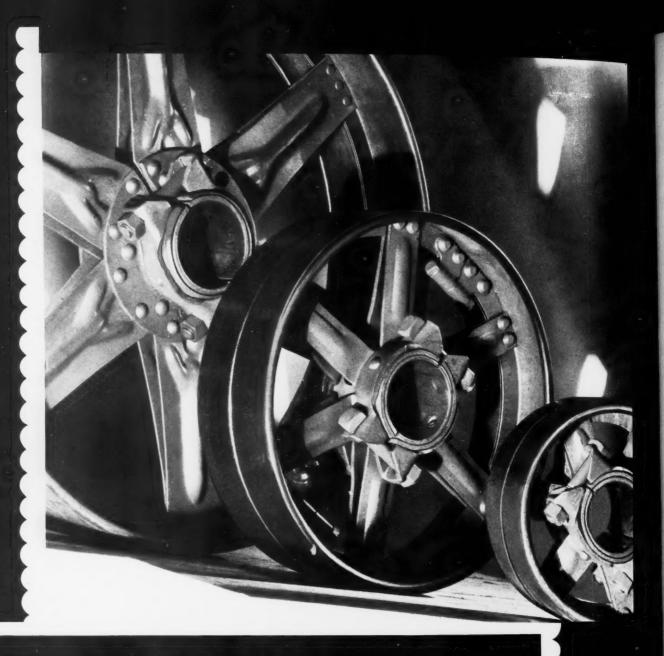
If you bought and paid for a 10 h.p. motor would you be satisfied with the delivery of one rated at 6 or 8? Yet that is what happens if the potential of your motor fails to reach your machine because of slipping belts.

The price of the best motor pulley is but a mere fraction of the cost of the equipment it will serve, or of the power it will transmit. Yet the selection of the best motor pulley should be a consideration of major importance, for this vital link between motor and machine measures the effective horse-power of your motors—the capacity of your machines—the production cost of your products—the profits to your business.

AMERICAN Sprucolite\* Pulleys possess the highest coefficient of friction of any commercially built pulleys. They are made of Sprucolite, a special, patented, synthetic material manufactured from clear Sitka Spruce reduced with a casein binder under hydraulic pressure of 3,000 tons to a homogeneous mass of uniform density. The ideal pulley material thus obtained is resilient, light in weight, possesses great strength, durability.

AMERICAN Sprucolite Pulleys are optional equipment on all leading makes of motors. They are available through a large number of dealers from coast to coast.

THE AMERICAN PULLEY COMPANY, 4200 Wissahickon Ave., Philadelphia, Pa.



## ARE YOUR PULLEYS RELICS OF A BYGONE AGE?

EISURELY production methods went out with the bustle and the buggy.

Today, your profit may depend on the turn of a pulley. For in this age of modern production methods, every element of carefully studied transmission systems must not only be capable of keeping pace, but of assisting in the race against time.

AMERICAN Pressed Steel Shafting Pulleys are the fastest pulleys offered to American Industry today. Scientifically designed for great strength with light weight, they reduce the dead load on the shaft. Thin A-braced arms cut the air instead of fanning it. They possess a higher coefficient of friction at high speeds due to their exclusive air escape that dissipates the air cushion under the belt. Carefully balanced, they lessen vibration. More durable, they eliminate costly breakdowns.

Look at your pulleys. Are they like these trim, efficient pressed steel power-savers that are serving business leaders the world over? If they are not, consult your transmission engineer. See your mill supply dealer. Consider the modernizing of your plant to take advantage of the great strides that have recently been made in mechanical power transmission.

THE AMERICAN PULLEY COMPANY, 4200 Wissahickon Ave., Philadelphia, Pa.

# Again Hisey Buffers Win on Competitive Test/

Leading Sporting Goods Manufacturer Selects Hisey TexDrive Buffers Because of Superior Mechanical and Electrical Design and Better Performance



HE Wilson Western Sporting Goods Company, Chicago one of the world's largest sporting goods

manufacturers-needed additional buffers in the golf club department. Following sound policy, the executives of this concern decided to test and compare carefully before buying.

#### **Every Test Points to Hisey**

Preliminary investigation sifted the choice down to three buffers—a Hisey TexDrive Buffer and two machines of competitive makes. They were subjected to every possible test. After carefully considering the merits of each machine on the basis of design, construction and the ability to render long, dependable and economical service, the Hisey TexDrive

Buffer was selected.



The comparison was so convincing that it was decided to standardize on Hisey. So an order for four TexDrive Buffers was placed.

reasons were given for selecting the Hisey machine:

- (1) Quiet operation
- (2) Accessibility of the motor
- (3) Greater ease in changing belts
- (4) Gooseneck construction gives more foot room for the operator
- (5) Bolting of machine to floor unnecessary because of the broad, substantial, well-weighted base of the TexDrive
- (6) Motor does not overheat at any time, even at highest speeds
- (7) No suggestion of mechanical trouble of any kind



#### Hisey TexDrive Buffers Cut Costs

Hisey Electric Buffers are designed to keep pace with the heaviest production requirements. They operate speedily, smoothly, quietly, free from annoying break-downs and failures because of their superior mechanical and electrical design.

In addition to the TexDrive featured in this advertisement, Hisey Electric Buffers are built in floor and bench types—ranging from 1/2 to 15 H. P.

Bulletin 42 illustrates why the Hisey TexDrive These seven good Buffer wins in competitive tests. Write for a copy.

Agents in All Principal Cities

#### HISEY-WOLF MACHINE CO.

lt's High Grade If Hisey Made"



Established 1896 CINCINNATI, OHIO, U.S.A.

BUFFERS Electric DRILLS . . . GRINDERS

## It's New!-



and for

# Tungsten -Carbide! -

Proper grinding of Tungsten Carbide Tools is the most important factor in their successful performance. In grinding this material, more costly than platinum, it is essential economy to use the most improved equipment. A fast, easy and efficient method is offered in the New Blount 14" Wet Cup Wheel Grinder.

The coupon below is for your convenience. The bulletin will reach you quickly.

#### J. G. BLOUNT CO.

**Everett** 

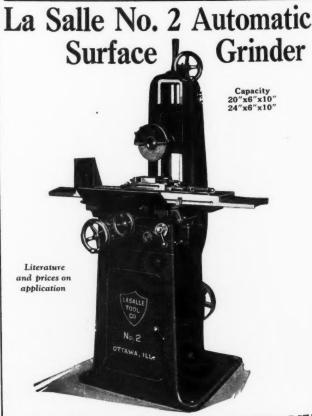
Mass.



THE Bath Grinder embodies many distinctive and desirable features essential for rapid and accurate production of commercial and tool room grinding.

This machine is adapted for the grinding of cylindrical, internal, surface, disc, cutter and reamer work of all kinds. Made in 2 sizes—12x36; 10x25. Drop a post card for catalog.

Fitchburg Grinding Machine Corp. Fitchburg, Mass.



LA SALLE TOOL COMPANY OTTAWA, ILLINOIS, U. S. A.

#### STANDARD HIGH SPEED SNAGGING GRINDER



Electric Drills, Grinding, Polishing and Buffing Machines in various types and sizes.

For use with Bakelite high speed ring wheels of 20", 24" and 30" diameter, 10" or 12" holes, running at 9000 SFPM.

Motors, 71/2, 10 and 15 H. P. sizes.

General Electric ball bearing motors. G. E. push button control. Shaft 4" diameter, nickel steel.

Bearings, 4 SKF Heavy Duty.

The Standard Electrical Tool Co.
1948 W. 8th St. Cincinnati, Ohio



CATALOG ON REQUEST

#### Set these packs of Lenox Wolves on the trail of your toughest jobs?

Thousands of shops the country over—shops whose work demands of hack saw blades the very finest quality that money can buy—have turned to these packs of rangy, rugged, super-strong Wolves of Lenox.

If you are looking for long-lasting, keen edges—for blades that cost less because they cut more, just ask for

The Tools in the Plaid Box

AMERICAN SAW & MFG. COMPANY Springfield, Mass.



A product by the makers of the famous Wolves of Lenox—hack saw blades. Send for a copy of "The story of the Wolves of Lenox."

#### REDUCE GRINDING COSTS

In small floor space—at low operating expense—this 12" x 36" Thompson Universal Grinder will handle all your surface, edge, internal, die, cutter and reamer grinding, as well as plain grinding between centers. There is a coarse feed provided for surface grinding and production is fast, as the work can be presented at any angle. Five table speeds—self-contained 3 H.P. motor.



THE THOMPSON GRINDER CO. 1534 W. Main Street, SPRINGFIELD, OHIO, U.S.A.

#### The "JARVIS" Bench Band Saw



For Metal Cutting Operations

The "Jarvis" Bench Band Saw cuts metals—straight, curved or bevel. It is motor driven, operates from a lamp socket and is vibrationless. Ball bearing disc wheels, worm drive.

12" size cuts up to  $1\frac{1}{2}$ " cold rolled steel, 16" size cuts up to 2" cold rolled steel. Also made for cutting soft metals, Bakelite fibre, transite, wood, etc.

Details gladly sent upon request.

BENJ. E. JARVIS, Inc. NEWARK NEW JERSEY

Walls Sales Corp., Agents 96 Warren St. New York City



Peerless 9" Universal Metal Sawing Machine with Motor drive.

#### **Stop Breaking Blades!**

Peerless Metal Sawing Machines incorporate important improvements which prevent blade breakage despite the high speeds at which these machines operate. One of many Peerless accuracy and economy features! Also ask about the Peerless 9" Standard and 16" Vertical Type Heavy Duty Sawing Machines. A complete line.

Peerless Machine Company
1218 Sixteenth Street RACINE, WIS.

Beerless

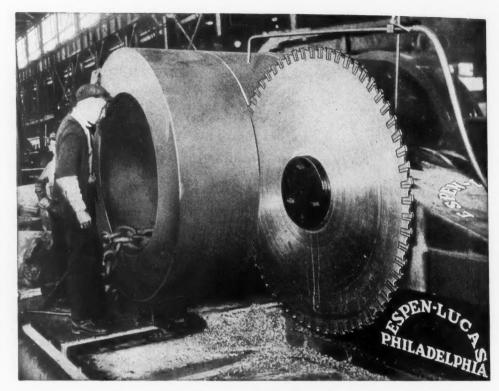


Peerless 6" Standard Metal Sawing Machine with Motor drive.

#### FAST AND ECONOMICAL SAWING

Tell us your needs, we have the knowledge, experience and will to correctly advise.

190 types and sizes of Sawing Machines for sawing all kinds of metal.



#### THE ESPEN-LUCAS MACHINE WORKS, Front St. and Girard Ave. PHILADELPHIA, PA.

# VERSATILITY

## The two features you need most

Versatility and precision—the prime essentials of any economical band saw are generously provided for in the Marvel No. 8 by these and many other salient features.

Also ask for

1. 18-inch capacity.

2. Tilting Blade Frame—cuts off square or at any angle right or left up to 45°.

3. Roomy bed and work table.

4. Three cutting speeds.5. Large quick acting vise.

6. Ball bearing band wheels, carriage and guide rollers.

7. New feed that registers blade pressure in pounds.

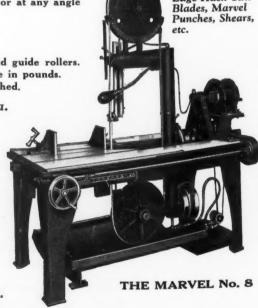
8. Convenient electric light fixture attached.

Write for complete data.



ARMSTRONG - BLUM MFG. CO.

343 N. Francisco Ave., Chicago, Ill.



P R E C I S I O N

information on Marvel High Speed Edge Hack Saw



# HUNTER

#### Saw Grinder

This compact, husky little grinder will enable you to keep your production rate consistently higher—assure you of

better work—and eliminate spoilage that comes from dull saws.

It is designed for sharpening, gumming and topping off all kinds of metal saws—inserted tooth or solid.

The grinding wheel is mounted on a swinging

We also Manufacture . . . . .

Inserted Tooth Saws
Circular Milling Saws
Pneumatic Hammer
Rivet Sets
Chisel Blanks and
Hardened Steel
Specialties

arbor whose pivot is rigidly held by two heavy bearing brackets bolted to the pedestal. The wheel moves forward

and back by means of a hand lever. A counterweight returns wheel automatically to original position when not in use.

The machine handles saws from 10 inches to 42 inches in diameter. Want further details? Ask for bulletin.

HUNTER SAW AND MACHINE CO.

5662 BUTLER STREET, PITTSBURGH, PENNA.

# It Takes a Lot of Power-

to drill holes to 3" diameter in solid steel. It takes built-in strength to insure the stamina that enables a drilling machine to stand up under such work.

#### The Defiance No. 3 Heavy Service Drill

with forged high carbon steel spindle, gravity oiling system, helical gear spindle nose drive and other valuable features has power, strength and capacity to handle drilling up to 3" diameter efficiently and economically.

Defiance Machines meet your most exacting standards on difficult classes of work. Send for details of the machines listed here.

#### The Defiance Line Includes:

Horizontal Boring Mills Cylinder Boring Machines Heavy Service Drilling Machines

Rail Drills Multiple Drilling Machines Multiple Tapping Machines Valve Grinding Machines

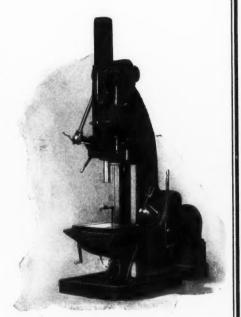
#### The Defiance Machine Works

Defiance, Ohio, U.S.A.

NEW YORK

Since 1850

LONDON



#### 10,000 R. P. M.

#### **Provides Correct Speeds for Every Job**

Sigourney No. 0 Ball Bearing Sensitive Bench Drills with speeds to 10,000 R.P.M. offer you exactly the right speed to drill any hole to 3/16" diameter; highly sensitive, well balanced, well built, they are ideal equipment for precision drilling, get good pro-



#### **ILLINOIS DIE FILING MACHINE**



A compact, reliable, smoothly operating machine for filing, stoning or sawing.
Furnished with or without over-

Size 12" by 18". Table 12" diameter 12" high. Spindle stroke 1". Height with overarm 2134".

Furnished regularly with ½ H.P.A.C. motor with round belt. It can be furnished for flat belt drive when peaces.

drive when necessary.

Descriptive circular and prices upon request.

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2501 N. KEELER AVE., CHICAGO, ILL. Manufacturers of Milling Cutters, Hobs and Special Tools.

#### U. S. HAND MILLERS For all classes of light milling

#### **U. S. SENSITIVE DRILLERS**

For all classes of light drilling Send for Circulars and Prices

UNITED STATES MACHINE TOOL CO. CINCINNATION ONLO



#### METAL CUTTING

There are Racine Machines for every metal cutting job.

The Shear Out for Production Work. The High Speed Saw for Regular Cutting The Band Saw for tood and metal The Abrasive Cutter for hardened steels. Accuracy, speed and long life are inbuilt characteristics of this equipment. Write.

RACINE TOOL & MACHINE CO., 1752 State St., Racine, Wis

# Avey

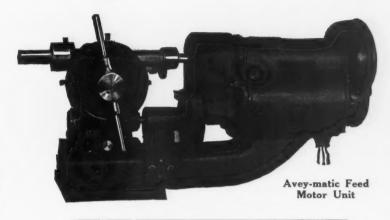
# How to Lower Costs on Production Drilling and Tapping

It's easy; just Avey-ize!

Avey equipment gives you all the advantages of special machines on production drilling and tapping work, with none of the disadvantages.

They are standardized units, hence far less in original cost. Their production capacities are at least equal to a special machine's—often greater—and are unexcelled in accuracy. Most important of all, they are practically unlimited in application; easily dismantled and reassembled to handle any change in vertical or horizontal drilling and tapping work. Compare with the usual special machine, often obsoleted by the most trifling alteration in the product's design.

Ask us to recommend an Avey Motor Unit for your special machine work. The details will convince you.

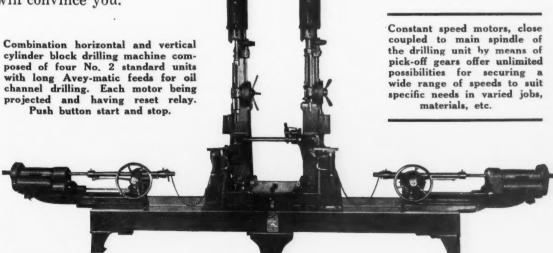


#### **AVEY PRODUCTS**

AVEY DRILLING MACHINES—5 sizes AVEY-MATIC DRILLING MACHINES—3 sizes AVEY BUILT-IN TAPPING UNITS—2 styles AVEY TAPPING ATTACHMENTS—plain—

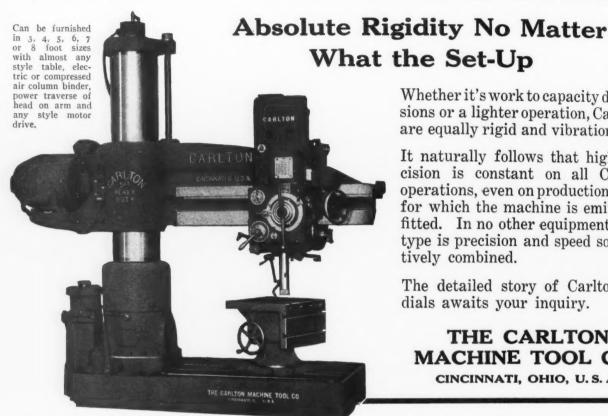
5 sizes
AVEY TAPPING ATTACHMENTS—back

geared—3 sizes
INDIVIDUAL MOTOR UNITS—2 styles
AVEY MILBAND CUTTING-OFF MACHINES
AVEY PULLEY LATHES
BERJO VISES



THE AVEY DRILLING MACHINE CO., Inc., Cincinnati, O.

# CARLTON RADIALS



Whether it's work to capacity dimensions or a lighter operation, Carltons are equally rigid and vibration-free.

It naturally follows that high precision is constant on all Carlton operations, even on production work, for which the machine is eminently fitted. In no other equipment of its type is precision and speed so effectively combined.

The detailed story of Carlton Radials awaits your inquiry.

THE CARLTON MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

## U.S. Multiple Drill Head

With this simple attachment your one-hole-ata-time drilling machine you can drill two, six or a dozen holes in the time it takes to drill one, and at a fraction of the cost of a multiple spindle drill press.

Send blueprints or sketches for our estimate of the savings possible on your work.



#### United States Drill Head Co.

1948 W. Sixth Street, CINCINNATI, OHIO Michigan Agents-National Sales Engrg. Corp., Detroit

#### You'll Be Surprised!

at the value we can build into a moderately priced drill by specializing in the production of drills only.

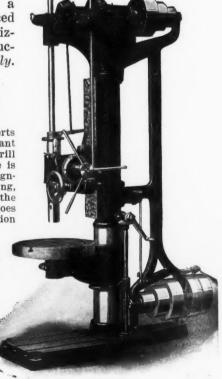
#### SIBLEY DRILLS

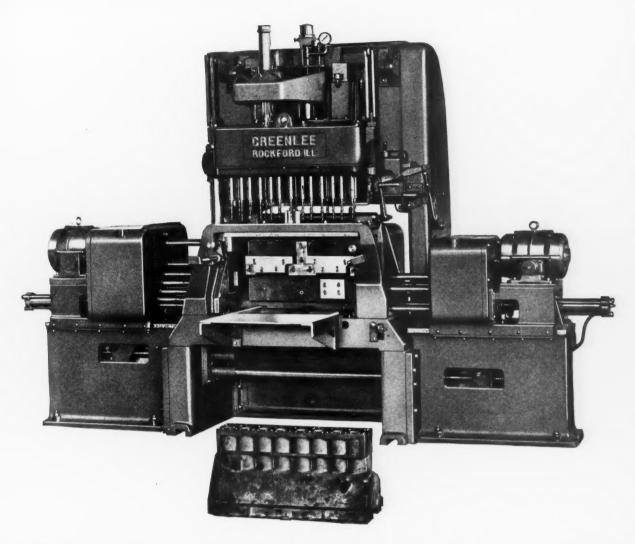
are built by experts in a modern plant designed for drill production. There is no waste in designmanufacturing, marketing — the price you pay goes into the construction of quality drills.

Send for Details of Sibley Drills

#### SIBLEY MACHINE COMPANY

8 Tutt Street **SOUTH BEND** IND., U. S. A.





# Sixty-Seven Spindles—Every One Drilling to Specified Accuracy

HIS Greenlee four-way, sixty-seven spindle, horizontal and vertical hydraulic-feed drilling machine drills all the holes in the top, side and ends of an automobile cylinder block for one of the world's outstanding eight-cylinder cars. Every hole is drilled to specified accuracy, so that no trouble will be encountered when the block reaches the assembly line. Another Greenlee machine, a mate to this four-way drill, handles all tapping operations. These two units naturally save this car manufacturer a tremendous sum by eliminating any additional fitting or hand tapping.

No mechanical ingenuity is required by the

operator of any Greenlee drilling or tapping machine. His work merely consists of placing the casting in the fixture, clamping and locating in one motion, and starting

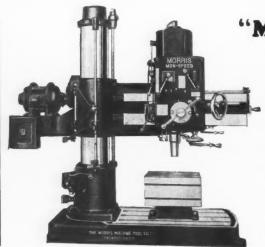
the hydraulic feed by means of a lever which is conveniently located. The machine then goes through its cycle of rapid approach, feeding movement and rapid return.

A safety feature which prevents the breaking of drills and spindles is provided so that the hydraulic pump for the feed can not be set in motion until the drills are revolving. This prevents the operator from throwing the feed in while the spindles are stationary.

Spindles, shafts and gearing throughout are of alloy steel, heat treated and mounted on ball or roller bearings. Individual oil pumps are supplied with each head, driven from gearing in the

head and easily removed for inspection. The oil is pumped through a glass tube at the top of head for cascade distribution over the various trains of gears and bearings.

Greenlee
BROS. & CO. G
ROCKFORD, ILLINOIS, U.S.A



#### "Mor-Speed"-the Safe Radial

Every feature to guarantee safety for machine, tools and work is incorporated in the New 13" Column "Mor-Speed" Radial. Single lever control clamps, lowers and elevates arm; Safety Arm Stop at top and bottom of column; Friction in Feed Train prevents damage when tool jams; automatic safety feed trip; dial depth gauge for tripping feed at predetermined depths; forced feed lubrication. In addition, all 27 speed changes are concentrated in head; powerful built-in Disc Clutch absorbs starting and reversing jars. Timken Bearings typify quality construction throughout. Write for complete description.

## THE MORRIS MACHINE TOOL CO. CINCINNATI, OHIO

Sold by Pratt and Whitney Company Agency Sales Dept.—Hartford, Connecticut SALES OFFICES IN: Birmingham, Boston, Chicago, San Francisco, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Rochester, St. Louis.

## Burke

## For Speedy Drilling



Fast and versatile, vibrationless, accurate—that's the Burke No. 222 Bench Drill on holes up to 3/8".

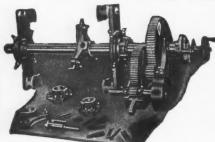
Spindle speeds range from 1150 to 2600 R.P.M. Four-position hand wheel for convenience. Special steel spindle, tapered for Jacobs or Almond Chuck. And a host of other features.

Ask for details of this drill, and submit your drilling problems for helpful suggestions.

#### THE BURKE MACHINE TOOL CO.

516 Sandusky St., Conneaut, Ohio, U.S.A.

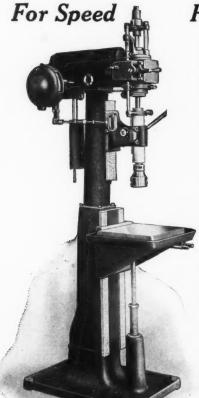
## Underwood Portable Tools A Tool for Every Purpose



Portable
Boring Bars
Crank Pin Turning Machines
Pipe Benders
Rotary Planers
Milling Machines
Flue Cleaners
Special Machines

H. B. UNDERWOOD CORP., Philadelphia, Pa-

#### SIMMONS TAPPING



For Profit

The Simmons No. 4 paces its field on all tapping work up to %" in steel. Its superior productive capacity insures greater earnings on your tapping jobs.

The No. 4 is entirely automatic and incorporates a geared head with three speeds through sliding gears and an efficient dental type reversing mechanism. Extra large SKF bearings are used throughout, resulting in vibrationless, accurate operation at all speeds If you tap you should look into this tool. Circulars on request.

W. H. SIMMONS & CO.

208-10-12 Lawrence St. CINCINNATI, O.

#### "SUPERIOR"

One word that fully characterizes the ability of Superior Drilling and Tapping Machines to render "SUPERIOR" drilling service. Write for complete catalog.

SUPERIOR MACHINE TOOL CO.



Kokomo, Indiana, U. S. A.

Make your drilling profitable with

HEFERDRILLERS
Take advantage of the "minute-saving" features

HOEFER MFG. CO., Freeport, Ill.

# Millholland Method of Flexible Manufacture

Unlimited Applications
Insure Continuous Service

There's no arguing the production advantages of special machines on multiple operation work — but they are costly and when the job for which they were designed is over, they are done too.

Here is the advantage of the Millholland Method. With these units set up on special bases or on standard machines you can perform any of the operations listed here simultaneously or in sequence as on any special machine and when the job is over the Millholland units are ready to be reassembled for another job.

Millholland Equipped you can:

DRILL—one hole or many, insuring correct spacing, uniform accuracy.

TAP—accurately thread any number of holes in any position.

MILL—accurately at maximum speed and feed.

SPOT FACE—fast and to extremely accurate depth.

REAM—holes to accurate diameters and fine finish.

BORE—to insure very accurate center distances.

THREAD—accurately, quickly, economically.

FACE—with accurately controlled feeds to secure fine finish.

Send us plans, drawings, etc., for your multiple production operations—let us show you how to improve production and reduce costs. Millholland Products embody many new and useful designs fully covered by patent applications.



SALES & ENGINEERING CO.

1833 Ludlow Ave.

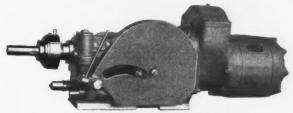
INDIANAPOLIS, IND.



No. 3-3" stroke; 1, 2 or 3 H.P. Motor Drive



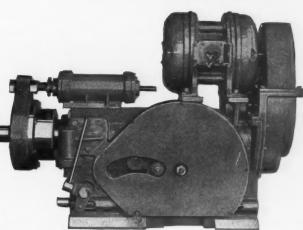
No. 4-4" stroke; 1, 2 or 3 H.P. Motor Drive



No. 5-5" stroke; 5 H.P. Motor Drive

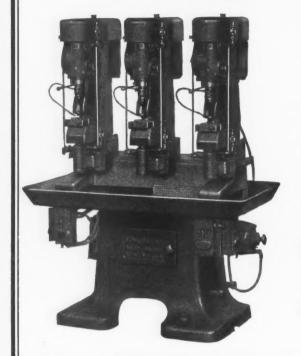


No. 3 Millholland Automatic Tapping Unit with flanged quill and air return, with Mechanical reverse mechanism. Stroke 3"; 2 and 3 H.P. motor drive.



No. 6-6" stroke: 5, 10 or 15 H.P. Motor Drive

# KINGSBURY Semi-Automatic Drilling and Burring Machine



This machine automatically clamps the work and drills the hole in the shortest practicable time with a feed that automatically adjusts itself to the resistance encountered. The bottom of the hole is countersunk to remove the burr and the piece can often be automatically ejected. These features permit a production up to 1500 to 2000 pieces per hour.

#### Kingsbury Machine Tool Corporation

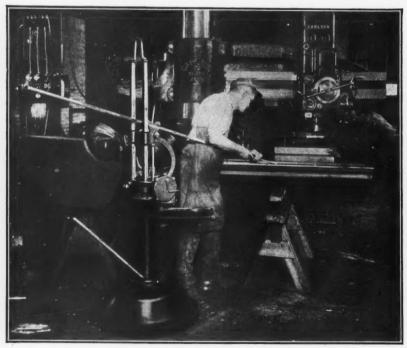
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:-:

New Hampshire

Originators of the Automatic Drilling Head Unit

## ANDERSON POWER SCRAPERS



#### "Hand Made" Finish Power Operated Production

Power operated and hand controlled—the Anderson Power Scraper enables the mechanic to get the results he is after in a fraction the time and with infinitely less effort than in using a hand scraper.

It is easily portable and operates from the ordinary lighting circuit with a working range of 6 feet. The operator simply moves it up to the job and goes to work.

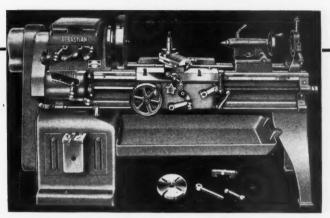
Every shop, every tool room, can use an Anderson Power Scraper with profit. We'd like to tell you about this tool and the results users are getting with it.

ANDERSON BROS. MANUFACTURING CO.

1910 Kishwaukee Street, Rockford, Ill.

16 speeds ranging from 15 to 730 R.P.M. and accurate!

> 16 x 6-8 speeds \$1200 as shown FOB Cincinnati





16 x 6-8 speeds \$1200 as shown FOB Cincinnati

The New 16-inch

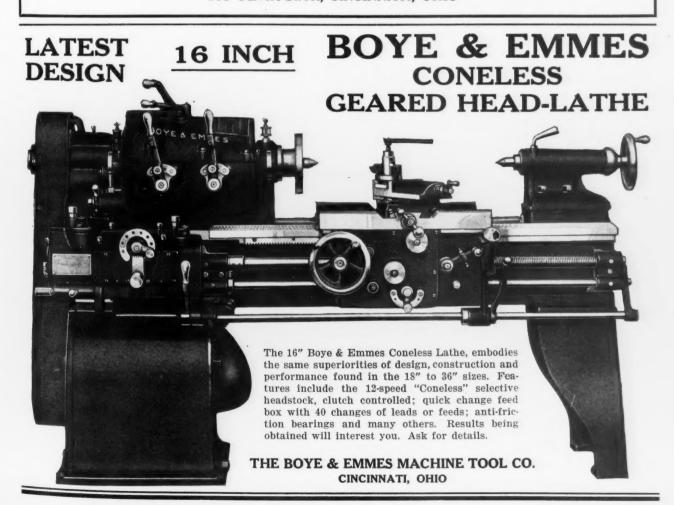
# GOLD SEAL Heavy Duty

"Gold Seal" and "production" are closely allied in the minds of prominent users of fine turning equipment. The New 16" Gold Seal Heavy Duty Lathe, is now Timken Bearing equipped, and embodies every feature and improvement for exceptionally high speed, vibrationless operation. Wide range of speeds and feeds, combined with capacity for unusual precision, adapts this new lathe for either shop or tool room.

In addition to operating economy you'll find remarkable lathe *value* in Gold Seal equipment. Write for details.

#### THE SEBASTIAN LATHE COMPANY

106 Culvert Street, CINCINNATI, OHIO



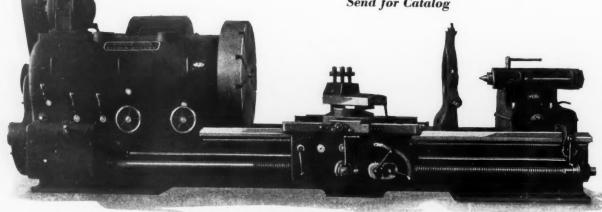
## WICKES 48" ENGINE LATHE



#### It's All Done With Bearings!

Ball and roller bearings, of the finest makes, throughout (except on main spindle), are the principal reasons for the unusual smoothness and accuracy of the Wickes 48" Engine Lathe. And of all Wickes lathes from 20" to 60".

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Est. 1856 BROTHERS, Saginaw, Michigan

Builders of Heavy Duty Engine Lathes, Special Production Lathes and Crankshaft Turning Equipment, Heavy Duty Plate and Structural Tools, Blue Print Machines

#### The Two Minute Set-Up and the Multiple Tooth Cutter

**DAVIS KEYSEATERS** 

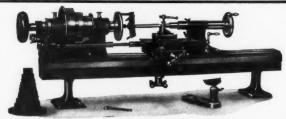
Reduce keyseating time, improve key seating quality - by reducing setting up time to the minimum and by utilizing to best advantage the principle of the "broaching pull cut" and multiple tooth cutters in their production method.

Capacity 1/16" to 1" wide in hubs to 12". Keyseat cutters H.S. and Carbon Steels in sixteenths and some thirtyseconds. Send for details and prices.



#### DAVIS KEYSEATER CO.

255 Mill Street, Rochester, N. Y.



Where PRECISION and ACCURACY count as in that die, gauge, tool and fine instrument work, the

#### Elgin Precision Bench Lathe

will be found particularly well adapted. It is built on the finest lines from the best material, has a larger number of, and more efficient attachments than any similar machine, and can be depended on for absolutely true work.

Catalog and particulars at your service

ELGIN TOOL WORKS, INC., Elgin, Illinois

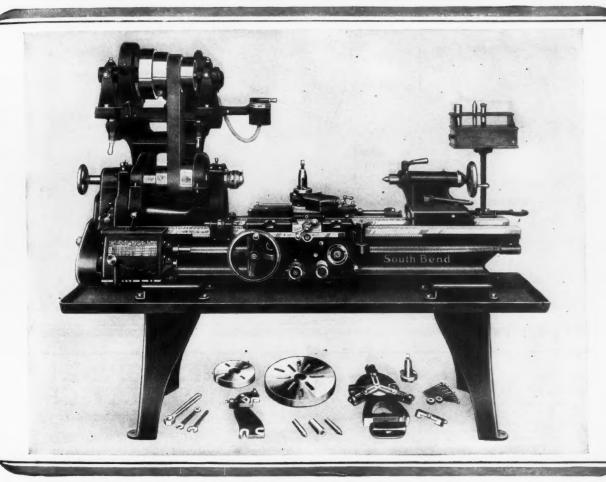
#### FLATHER LATHES

**Highest Grade for Tool-Room** and Manufacturing Purposes

The Flather Co., Nashua, N. H.



# H BEND LAT



Counter Shaft Driven Lathes Motor Driven Lathes Quick Change Gear Lathes Standard Change Gear Lathes Tool Room Lathes Gap Bed Lathes Brake Drum Lathes Bench Lathes



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showing the 96 sizes and types of the New Model South Bend Lathes—a valuable reference book for anyone interested in mechanics. Free upon request.

96 types and sizes of New Model Lathes are now available with countershaft drive and motor drive for the manufacturing plant, production work, tool room and machine shop.

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Lathe Builders for 24 Years

South Bend, Indiana, U.S.A. 777 E. Madison St.

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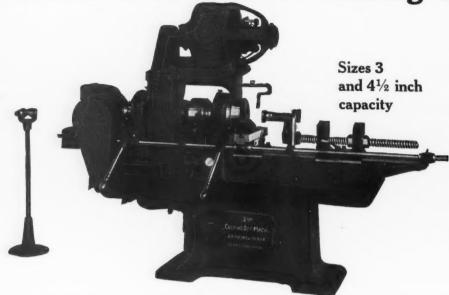
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# **Bardons & Oliver Cutting-off Machines**



Operated by One Motion of

Spindle runs in Timken Roller Bearings.

Safe, Free running up to 1000 R.P.M.

Collet form of Chuck-Air Operated.

Automatic engagement of Roller Feed.

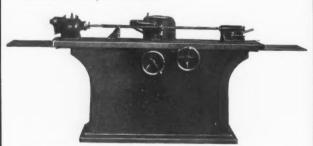
Roller Feed rolls driven by Separate Motor, therefore Independent of spindle speeds.

These Smaller Cutting-off Machines embody the same features as our large 6" to 14" machines, but are exceedingly fast. They have produced up to 8 or 10 cuts or more per minute on average work and for very light work about double that amount.

### BARDONS & OLIVER, Cleveland, Ohio, U. S. A.

# SAVE 2 on Broach Sharpening

If you are now using ordinary grinding equipment for sharpening broaches, a COLONIAL BROACH SHARPENER will reduce your grinding costs by two-thirds — actual figures prove this. COLONIAL is specifically designed for sharpening broaches—naturally, it's fast, grinds teeth and under-cut better and produces the equivalent of a new tool every time. A very few broaches justify the small investment required for this economical machine. Ask for details.



COLONIAL BROACH CO. DETROIT, MICH. 147 Jos. Campau Ave.,

#### **CONE 4-SPINDLE AUTOMATICS**

are economical and accurate producers of screw machine parts up to  $4\frac{3}{8}$ " diameter, 7" milling length. They cut costs, increase production, boost profits. Write for particulars.

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#### "If It's RIVETT, It's Right"

Rivett 608 Back Geared Precision Screw Cutting Lathes, Bulle-

Rivett Series 505 Plain Precision Bench Lathes,  $\frac{1}{2}$ " to  $1\frac{1}{6}$ " collet capacity, Bulletin 505-C.

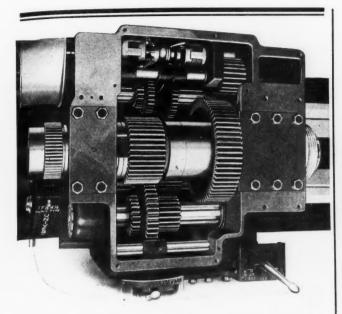
Rivett Series 507 Medium Priced Precision Bench Lathes, Bulle-tin 507-B.

Speed Box Motor Drives, Ball Bearing countershafts and jackshafts for all above lathes. Rivett 104 Precision Internal-External Grinding Machines, Bulletin 104-B.

Rivett Improved Thread Tools and Cutters, Bulletin 110-A.

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RIVETT LATHE & GRINDER CORP. BOSTON, MASS. **Brighton District** 



# Heavy—Powerful Headstock of Cincinnati Acme

17 & 41/2" Univ. Turret Lathe

A few features—

#### SPEED TRANSMISSION

Multiple splined alloy steel sliding gear type. Timken mounted transmission shafts.

Spindle ball thrust bearing.

Ball bearing outboard support for pulley.

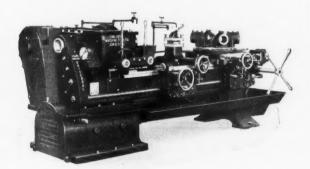
Disc clutch automatically disengaged when changing speeds.

No gears rotate on spindle.

Positive self-lubrication.

Simple 2-lever control for speed changes, start, stop and reverse.

All gears in head heat-treated and hardened.



THE ACME MACHINE TOOL CO.

4955 Spring Grove Ave.

Cincinnati, Ohio



# An unusual cutting job

When a prominent truck and bus manufacturer\* wished to be doubly sure that the babbitt bearings in the large bore of the connecting rods would never work loose, it was decided to use anchor grooves in addition to the usual practice of holding babbitt.

However, the regular method of cutting grooves could not be used because it was necessary to cut them in the elliptical bore before splitting. The Wicaco Continuous Oil Groover solved the problem!

Since the cutting tool and not the work holder revolves on the Wicaco, this operation offered no difficulty at all. One side of the rod was cut, then, with the machine in motion and the tool still cutting, the work was fed in the opposite direction to cut the other side of the rod. Furthermore, the operator maintained a production of 80 bearings per hour with ease.

This is just one of the many unusual operations performed with no difficulty at all on the "Wicaco." May we send you complete data on this remarkable machine?

\* Name furnished on request.

The WICACO MACHINE CORPORATION 4803 Stenton Ave., Wayne Junction, Phila., Pa.

Kindly mail me at once your catalog giving complete information on the Wicaco Continuous Oil Groover.

Name....

Street

City \_\_\_\_\_



# RANT Noiseless Rivet Spinner

### "Rattle Proof" Assembly a Motor Cycle Requisite

Strength is one of the first requisites in motor cycle assembly and Grant Rivets are strong and rigid as well as good looking with smooth, cleanly spun heads that improve the appearance of the part.

Grant Noiseless Rivet Spinners are fast, accurate, economical. In types and sizes for a wide range of work.

Send for details of Grant Riveters ask about our Noiseless Spinning and Rotary Vibratory models.

#### THE GRANT MFG. & MACHINE COMPANY

N. W. Station, Bridgeport, Conn.

## **ECONOMY**

On Small Part Threading

"Accuracy plus greater speed and economy than we ever thought possible on parts 2" or less in diameter"—say users of the Improved Waltham Thread Miller.

New system for dis-tribution and disposi-tion of coolant insures faster, keener cutting and increased machine and tool life. Swivel range of cutter head is now 35° - may be swiveled horizontally as well. Semi-automatic operation and convenient control permit the use of un-skilled operators. Let us tell vou more about this machine. Write.



External or internal threading.

#### WALTHAM MACHINE WORKS

Newton Street, Waltham, Mass.

Makers of Small Thread Milliers, Gear Cutters, and other Small Automatic Machines
Foreign Representatives: Buck & Hickman, Ltd., London, Fenwick Freres Co., Paris, Andrews & George Co., Tokyo, Japan. Andrews & George Co., Dairen, Manchuria.

#### Anderson Improved **Balancing Ways NO LEVELING REQUIRED**



the following sizes		
Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in. 40 60 72 96	20 in. 30 " 30 " 66 " 88 "	1,000 2,000 2,000 5,000 10,000

A simple and excellent device for balancing, etraightening and

Write for full information

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Knight Millers

Accurate

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W. B. Knight Machinery Co. 3920 Pine Street

#### **MACHINES ENGRAVING**

MARKING MACHINES GRADUATING MACHINES ENGINE TURNING MACHINES DIE AND FORCE CUTTING MACHINES

H. P. PREIS & CO., Inc., 538 So. 10th St., Newark, N. J.

## A New

3 point contact

# Standardized September 1, 1930



#### excess strength The CAD U-Clamp is the BIG BRUTE Machine Shop Clamp

BRIDGE DESIGN =

Made for your big boring mills and planers that require \%"-1"-1\%" bolts.

Ask for CAD Circular A-51

CAST STEEL 10 TO 15 TONS SAFE LOAD 8"-10"-12"-16" LONG

STANDARD SHOP EQUIPMENT CO., INC., 8139 TINICUM AVE., Philadelphia, Pa.

Set-up appliances for machine tools

CARRIED IN STOCK BY:

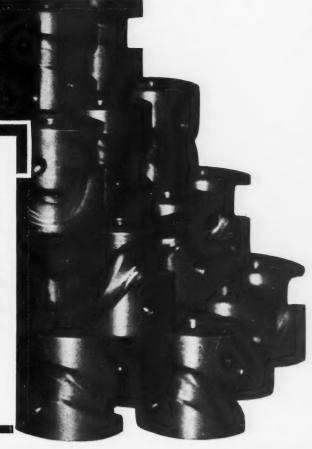
Beals, McCarthy & Rodgers, 50 Terrace, Buffalo, N. Y.
Cleveland Tool & Supply Co., 1427 W. 6th St., Cleveland, Ohio
E. A. Kinsey Co., 331 W. 4th St., Cincinnati, Ohio
Vonnegutt Hardware
Vonnegutt Hardware
Co., Indianapolis, Ind.

Hardened machine steel barrel cams 23/8" diameter, 2-3/16" long with a groove 3/4" diameter, 3/8" deep. Important parts in the construction of an automatic making safety razor parts.

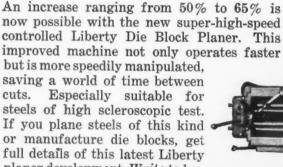
Some manufacturers of automatics save money on cams by ordering from Rowbottom; others install a Rowbottom Cam Milling Machine department. Let us estimate on your cam needs and advise you as to the most economical method of meeting them the "Rowbottom way."

THE ROWBOTTOM MACHINE CO. WATERBURY, CONN., U. S. A.

Factory: Waterville, Conn.



"Step Up" Your Die Block Production





# SHAPER—SLOTTER The Rhodes Convertible

In one machine this Rhodes combines a 7" Horizontal Shaper and, by means of a few simple, easily made changes, a 3\%" Vertical Slotter—and operates efficiently and profitably in either form.



# There have been more than 1160 CLEVELAND OPEN PLANERS Installed

Cleveland Open Side Planers—speedy, simple in construction and enduring in service are available in several lengths of table—Sizes 26", 30", 36", 42", 48", 60" and 72".

Note the Cleveland characteristics. They indicate why a regiment of them are in use and why the number is constantly growing.

Found in Cleveland Open Side Planers

Dial Feed; Power Rapid Traverse; Forced Feed Lubrication to Vees; Improved Head Clamp; Box Table; Single Turn Rail Clamp; Automatic Trip to Rall Raising Mechanism.



The Open Side Planer with the Column Base Cast Integral with Its Closed Top Bed.

THE CLEVELAND PLANER COMPANY
3148 Superior Ave. Established 1900 CLEVELAND, OHIO

#### Shapers Exclusively

12", 14", 16" 20" 25"—Gear Box single pulley or motor drive, also 16", 20", 25" B.G. cone drive with belt shifter. 32" B. G. all geared single pulley or motor drive, all crank type "V" ram.

THE SMITH & MILLS COMPANY OHIO, U. S. A.

## JONES

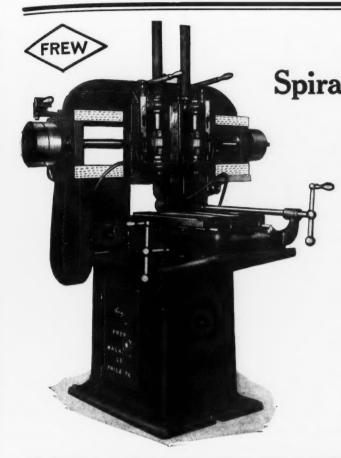
PATENTED
Horizontal Boring Mills
Vertical Boring Mills

## MACHINE

Slotters Vertical Shapers

JONES MACHINE TOOL WORKS, Inc. 53rd and Lanedowne Avenue, Philadelphia, Pa.

7" Horizontal Shaper.



# FREW No. 5 Spiral Gear Driven Profilers

Use this Frew model for efficient production of parts produced from master forms—a valuable installation in typewriter, adding machine, sewing machine and other similar plants. Hardened steel ground spiral gear drive to spindle eliminates belt and insures minimum vibration and power loss.

#### Frew Profilers are Built to Your Requirements

No two profiling jobs are alike, but Frew Profilers are built to meet every profiling need.

State your requirements. Send us blue prints of your profiling jobs — Frew experts will show you how to fulfill them *economically*.

#### THE FREW MACHINE CO.

132 W. Venango St., Philadelphia, Pa.

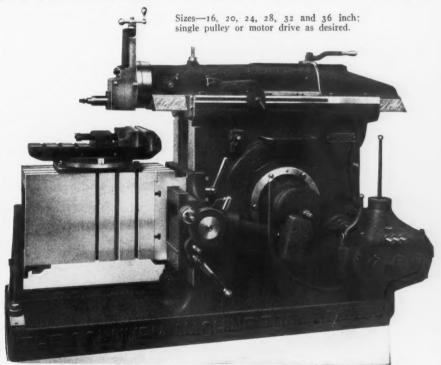
# NOW! Columbia has done it

Years of careful study of the needs of Shaper users have enabled Columbia to produce "the shaper you've always wished someone would build."

Columbia Superior Shapers embody every needed feature and advantage (many exclusive) that afford greater speed, power, capacity, facility of control, long life and economy for your shaping work. Some remarkably unique structural features. Your file is incomplete without a description of this machine. Write today for details.

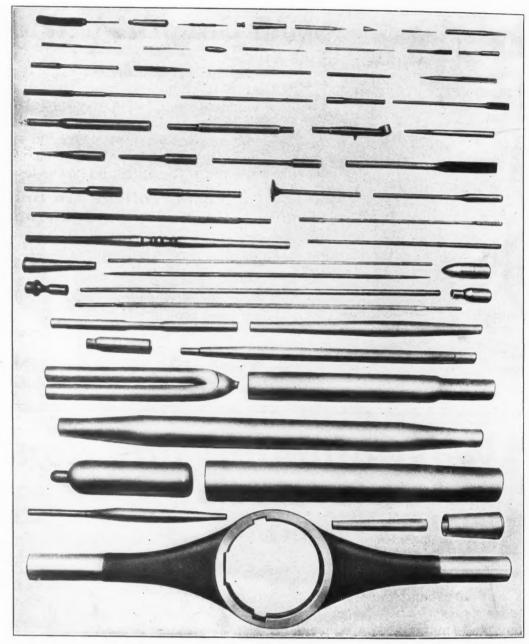
The Columbia Machine Tool Co.

Hamilton, Ohio, U. S. A.



## **COLUMBIA SUPERIOR SHAPERS**

# 50 Years Building Swaging Machines



Samples of work swaged on Langelier Machines for most economically reducing, refining and saving metal

E manufacture 25 types of Swagers with capacities from pin pointing to 5" diameter stock, our machines swaging such parts as Caliper legs, auto housings, tubular propeller shafts, drive shafts, stub shafts, gear shift levers, valve stems, motorcycle forks, steering knuckles, steering drag links, brake yokes. cutlery, textile spindles, tungsten filament wire, boiler tubes, superheater units, screw drivers, tapper tap shanks, ice and nut picks, dental instruments,

button hooks, oil can spouts, tapered axle ends, tie rods, wire spokes, temple butts for eye-glass frames, bicycle handle bars, nail sets, center punches, drift pins, knife tangs, wrench handles, ignition and carburetor control levers, machinists' tools, steering housing tubes, twist drills, wire pointing, baby carriage parts, jewelry, telephone parts, optical parts, tubing and miscellaneous forgings.

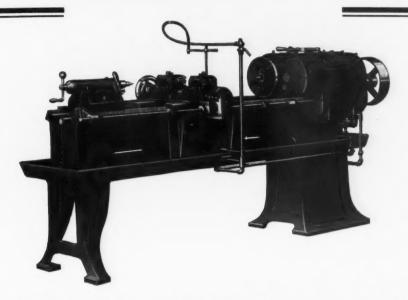
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THERE'S NO SUBSTITUTE FOR 50 YEARS' EXPERIENCE

## LANGELIER MANUFACTURING CO., Providence, R. I.

Designers and Builders of Hot and Cold Swaging Machines, Hammering Machines, Sensitive Drills, Multiple Spindle Drilling and Tapping Machines, Multiple Spindle Attachable Drill Heads, Automatic Drilling and Tapping Units.

# Coulter Automatics



#### AUTOMATIC THREADING LATHES

Coulter Automatic Threading Lathes meet modern production demands for lead screws, worms, half nuts, chain hoist screws, bolts, nuts, chuck jaws, automotive truck and car axles, gill screws and other threading jobs by cutting any desired form of single or multiple, straight or taper, internal or external thread with positive precision accuracy at production speed.

The double tooling feature of Coulter Threading Lathes permits heavier, cleaner cuts and the automatically controlled back-shaft eliminates lost motion and hand operations, saving productive time and increasing production.

Write for complete catalogue showing full details; sent without cost upon request.



DIAMOND TOOL BORING MACHINES OPEN-SIDE SHAPER-PLANERS AUTOMATIC PROFILING MACHINES HOB THREAD MILLING MACHINES

Information on request

The AUTOMATIC MACHINE CO.
BRIDGEPORT, CONN. U.S.A.

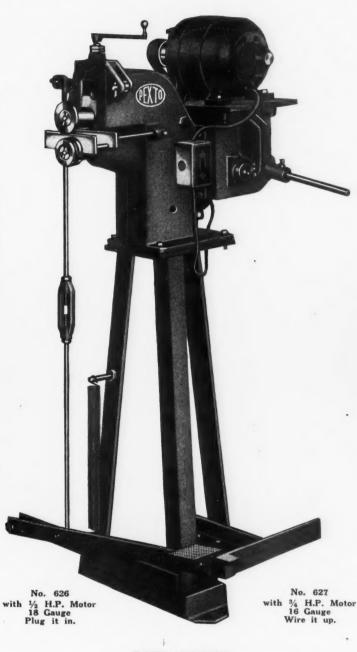


NAZEL ENGINEERING AND MACHINE WORKS
4043 N. Fifth Street, Philadelphia, Pa.

# "SPEED KING" by Pexto

#### 15 GREAT ADVANTAGES

- 1. Foot Treadle or Crank Screw for depressing Upper Roll.
- 2. Double Friction Clutch
   Hand operated or
  Foot Control (both regular equipment). Forward or Reverse Drive.
  Instantaneous starting
  and stopping of rolls,
  Locks in three positions
  automatically.
- Three Speeds through simple quick change of one Pulley. Three pulleys furnished.
- Belted drive from Motor. Silent operation, eliminating noise as in highspeed motor gears.
- 5. Automatic Belt Tightener requiring no attention.
- Continuous Belting —
   One belt for each Pulley regular equipment.
- 7. Positive lateral adjustment of Upper Roll for proper alignment.
- 8. Convenient tilting device for Upper Shaft.
- Alemite Zerk Lubrication on Lower Speed Shafts. Grease Gun furnished with every Machine.



- 10. High-speed Shafts lubricated automatically from Oil Reservoir.
- 11. Completely enclosed Gear Box, Gear and Clutch Mechanism running in light Grease. Inspection required once
- 12. All Bearings Bronze Bushed.
- 13. One-piece heavy Frame of rigid design.
- 14. All-steel, strong Pedes-
- 15. Forged two-piece Crank Screw with Lock Nuts.



Foot treadle or Hand lever for Clutch control is regular Equipment.

#### **OPERATIONS**

For turning, wiring, burring, elbow edging, crimping, beading and slitting.

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Your Insurance - Over 110



Years of Conservative Growth

THE PECK, STOW & WILCOX CO.

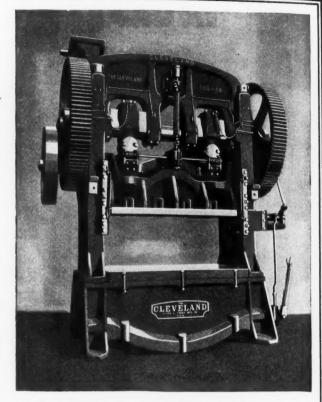
Southington, Conn., U.S.A.

# **Speed production** with **Cleveland Presses**

The demand for Cleveland Power Presses is constantly increasing because alert manufacturers, recognizing that this is an age of pressed metal, turn to Cleveland for information that will enable them to reduce manufacturing costs by producing some erstwhile casting as a lighter—stronger—more durable stamping or forging.

Besides, the economics that may be effected through the use of Power Presses are becoming more and more matters of accepted fact, as evidenced by the ever widening markets and new methods of production which are constantly being developed.

Cleveland builds presses to take care of every stamping need from the smallest open back inclinable to the largest single and double crank toggle, and places their wide experience and engineering knowledge at the disposal of manufacturers interested in obtaining the correct type of Presses for their particular requirements.

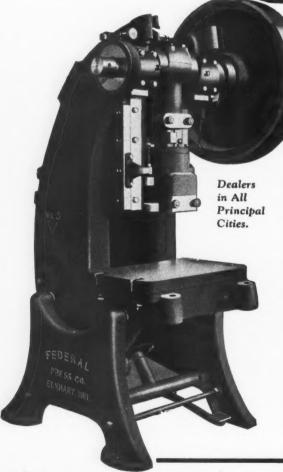


THE CLEVELAND PUNCH & SHEAR WORKS CO.

NEW YORK - CHICAGO

CLEVELAND, OHIO

DETROIT - PITTSBURGH



# **FEDERAL**

"BUILT FOR SERVICE"

**PRESSES** 

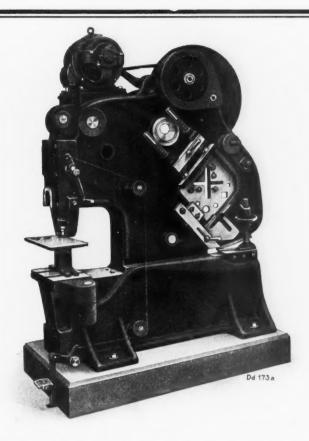
Durability is a distinctive feature of Federal Presses. They are unusually sturdy and rugged, every point of stress being also a point of strength. The body is heavy and symmetrical, and yet the metal is properly distributed to avoid shrinkage strains and give strength where strength is needed.

Maximum production is assured from the long guides and the perfect alignment of the ram. Exceptional ease of operation resulting from simplicity of design also eliminates much of the idle time of operators. There is a Federal dealer near you who would be glad to tell you about Federal "Built for Service" Presses.

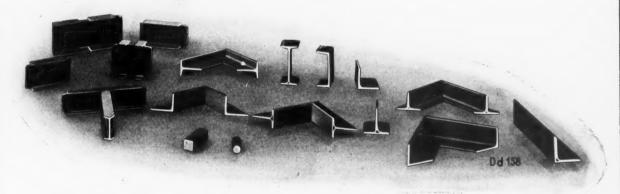
MANUFACTURED BY

FEDERAL PRESS CO.

ELKHART, INDIANA



New Style SCHATZ Universal Punch, Splitting Shear, Structural Steel and Miter Cutter and Coping Machine No. 246-G, built in four sizes for cutting 4x4x3/8, 4x4x1/2, 6x6x1/2 and 6x6x5/8 Angles and Tees, etc.



Samples of cuts made on the New Style Schatz Universal Punch, Shear and Coping Machine.

Guaranteed Unbreakable Frame of Steel Casting.

Plate Straightening Device.

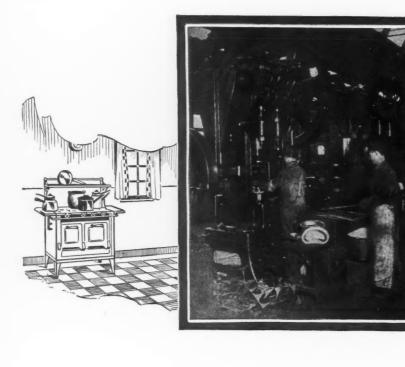
Quick Swing-away and Swiveling Coping Tool on Punch End, Maintaining Correct Working Height and Accurate Work.

RUGGED — ACCURATE — HIGH CAPACITIES — LOW COST!

THE SCHATZ MANUFACTURING CO.

POUGHKEEPSIE, N.Y.

"UNUSUAL MACHINE TOOLS"





# Modern Kitchenware is produced by Bliss Presses

It is literally impossible to find a kitchen without some utensil or appliance that has been made by a Bliss Press. The vast assortment of pots, pans, and other vessels used as kitchen containers is blanked, drawn, and formed largely on Bliss equipment.

And kitchenware is only one of an unending list of sheet metal products that have reached a wider market through the economical production made possible by Bliss equipment. Whatever sheet metal operations may be performed in your plant, it will pay you to investigate the possibilities of doing them quicker or at less cost by the Bliss method. Our 70-year experience is at your service.

## E. W. BLISS CO. MAIN OFFICE BROOKLYN, N. Y., U. S. A.

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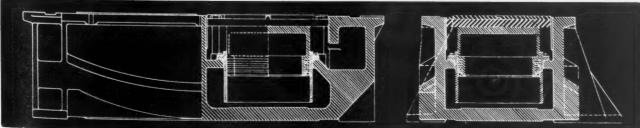
# BLISS

# MARQUETTE CUSHIONED PRESS BED

A great advance in stamping equipment. Has air cushion blank holder built in—eliminates need for foundation pits—makes it possible to move big presses about the shop as desired—does away with auxiliary pressure tank—simplifies pipe connections—fewer moving parts—less maintenance cost. Can be built to fit any standard size and type of press now in use. On new installations it should be standard equipment.

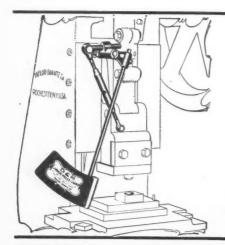
Write for quotations.





MARQUETTE TOOL & MFG. CO. 6495 WEST 65TH ST.—CHICAGO, ILLINOIS

MACHINERY, August, 1930-181



#### Protect your press workers—

Increase your press work profits. Every power press accident sets back production and profits more than you can count.

#### D & M Automatic Press Guards

actually eliminate power press accidents. They are so simple and easily attached, they operate so effectually that once used they become an indispensable part of your power presses.

In sending for details give full information regarding your press equipment and state whether left to right or right to left hand swing is desired.

## TAYLOR-SHANTZ CO., 485 St. Paul Street ROCHESTER, N. Y.

#### PRESS PRODUCTI



Invariably profitable the right "American." Foolproof construction for trouble-free service guarantees constant operating efficiency.

The V2 Hydraulic Press (shown) is in 6 and 12 ton sizes. Wide throat and 21" and 27" stroke give capacity for wide variety of work; hydraulic operation - ram automatically returns to tap or release of levers; when equipped with flexible control any pressure from 0 to maximum can be applied by increasing pressure on operating

> American Presses in 2 to 50 ton sizes. Send for details of the line.

AMERICAN BROACH & MACHINE CO.

Ann Arbor - Michigan

Builders of All Types of Broaching Machines and Broaching Tools.



Quick SES Loading

**DOUBLE SWIVEL REELS** 

for use with roll feeds, etc. SINGLE INCLINABLE REELS for hand feeding.

HORIZONTAL REELS

for round wire.

DISC REELS

for brass, copper, etc.

S & S MACHINE WORKS

4541 W. LAKE STREET

CHICAGO, ILL., U. S. A.



#### Saves 10 to 25 per cent

Users report savings ranging from 10% to 25% with the Improved Wiesman Punch Press Guard. It's faster and safer. Guard arm is always half a stroke ahead of operator. Protects both his hands yet recedes quickly, allowing him to feed fast and naturally. Every modern press should have this economical guard. Try one!

Wiesman Mfg. Co. 31 to 35 South St. Clair St. DAYTON, OHIO, U. S. A.

There are 8 Types and 16 Sizes in the METALWOOD line of

## STRAIGHTENING PRESSES

Our new 24-page Catalog descriptive of the above is ready for distribution

METALWOOD MANUFACTURING CO. **DETROIT, MICHIGAN** 



EFFICIENT LUBRICATION







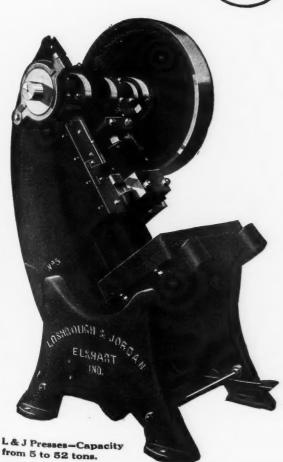
Probable length of efficient service is a point to consider in buying a power press—particularly as the qualities that increase durability need not necessarily increase purchase cost.

The L-J System of Efficient Lubrication by reducing friction in operation reduces wear on the moving parts and so increases the naturally long life of these correctly designed well built machines.

L-J Power Presses are built to give long efficient service. The general design of the line embodies the best modern press standards; construction leaves nothing to be desired either as to quality or accuracy, and such special features as the L-J System of Efficient Lubrication, the Non-Repeat Tripping Device and the Shock Absorbing Latch insure efficiency and durability that make each L-J Power Press a profitable installation. Send for details of the L-J Line.

Loshbough-Jordan Tool & Machine Co. ELKHART INDIANA

Exclusive Builders of Inclinable Presses for Eighteen Years



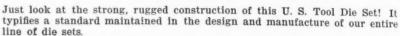
## STANDARD



## DIE SETS

## HUSKIER DIE SHOE and PUNCH HOLDER

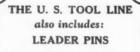
- minimizes the danger of breakage
There is a difference in Die Sets!



Note the Punch Holder is of solid one-piece construction and that the leader pin bearings are long and well proportioned. Look at the thickness of the Die Shoe!

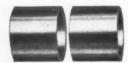
Every U. S. Tool Die Set is designed with ample strength to handle any work within its capacity, without danger of breakage.

It costs more to build die sets to a standard rather than a price—but the buyer gets the bargain! There is a difference in die sets—try a U. S. Tool Die Set and see!









—and standard supplies for Die Makers, Toolrooms and the Metal Stamping Industry.

#### NATIONAL DISTRIBUTION-

You can buy U. S. Tool Die Sets and accessories everywhere!

Probably the Leading Machine Tool Supply House in your territory is our distributor and carries a stock of U.S. Tool Standard Die Sets and Accessories—available for immediate delivery.

Just Off the Press-A NEW CATALOG!

> Write Department M



U.S. TOOL COMPANY Inc. NEW JERSEY USA

## THE "TOLEDO"

PRESSES FOR EVERY PURPOSE!

#### Horning and Wiring Presses

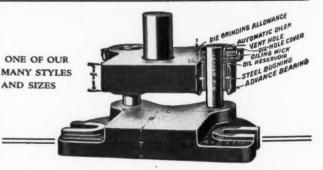


"Toledo" Horning and Wiring Presses are well-known for their ability to turn out an unusually wide range of work on a low cost basis. Bodies or frames are constructed to accommodate special bolsters, horns, forces or other devices. On pierced tin or stamped wear these "Toledo" Presses maintain a high standard of precision while producing at top speed.

Twenty sizes adequately meet every individual requirement. Write for complete descriptions.

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Engineers, Founders and Machinists on
Equipment for Sheet Metal Products



# Baumbach Standard Automatic Oiled DIE SETS

Made of 25% Steel

Get our new 120 page Die Set Guide listing 70,000 Sizes. Select your own Standard



Baumbach Die Sets built this Modern Plant

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GENERAL OFFICE & WORKS

1810 South Kilbourn Avenue, CHICAGO, ILLINOIS
Sales and Engineering Offices in principal cities
U. S. A. and Canada



MANY a man whose Niagara Squaring Shear is still in service rode down on a bicycle to see it unloaded, back in the days when he never dreamed of owning an automobile.

Long service is the usual rather than the rare experience with Niagara Shears equipped with Niagara knives.

From this complete line you can select the shear exactly meeting your requirements. Cutting lengths up to 16 feet for all gauges from light tin up to ¾ in. soft steel plate.

Write for bulletins Nos. 71, 72, 73 for complete information. Many standard sizes in stock ready for immediate delivery.

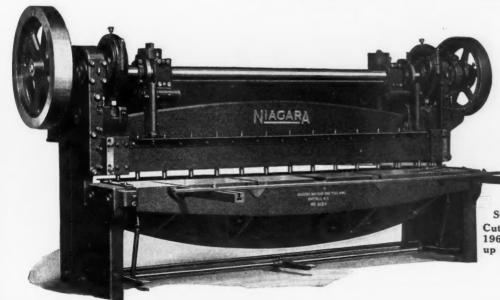
#### NIAGARA MACHINE & TOOL WORKS

637-697 Northland Avenue, Buffalo, N. Y.

Philadelphia Elverson Bldg. New York City 50 Church St. Pittsburgh Park Bldg.

# NIAGARA

MACHINES, TOOLS AND DIES FOR SHEET METAL WORKING



No. 3120
SQUARING SHEAR
Cutting lengths 30" to
196" for cutting sheets
up to 34" thickness.



Lead Extruding Presses for covering cable and manufacture of rubber hose.



General Utility Press can be used in either Vertical or Horizon-

# WATSON-STILLMAN Hydraulic Presses ARE MADE For Every Purpose

Before making a purchase of hydraulic equipment of any kind it will pay you to get in touch with us and see what we have to offer.

Forging Presses
Broaching Presses
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Car Wheel Presses
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Heating Presses
Heating Presses
Moulding Presses
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Pumps, Fittings, etc., etc.

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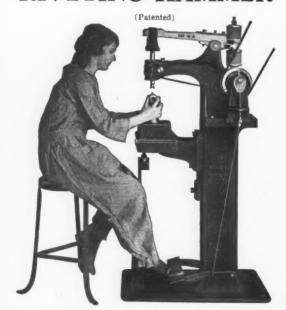


Moulding Press for Plastic Materials.



Hydro-Pneumatic Forcing & Bushing Press.

# THE HIGH SPEED RIVETING HAMMER



Nine sizes for cold riveting, 1/64 to 1½ in. in diameter

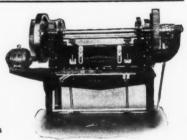
Send riveting samples for demonstration

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THE HIGH SPEED HAMMER CO., Inc. 305-321 Norton St., ROCHESTER, N. Y., U. S. A.

#### Robinson Sheet Metal Working Machinery

Inclinable Presses
Double Crank Presses
Horning Presses
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Gap Presses
Squaring Shears



Gap Shears Corrugating Machines Hand and Power Brakes

#### NEW ALBANY MACHINE MFG. CO.

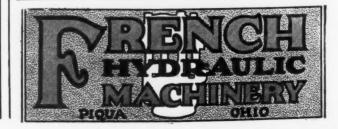
Sole Owners J. M. Robinson Mfg. Co. NEW ALBANY, IND.

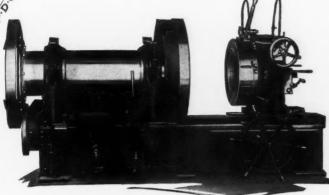
#### **Hurlbut, Rogers Cutting-off Machines**

Have patented features found in no other machines; speeds and feeds to suit all metals. Capacity to 10" stock.

Write for catalog

THE HURLBUT, ROGERS MACHINERY CO., Nashua, N. H.





# **Breaking** New Trails

When the weather is hot, the man in the shop appreciates every improvement that lessens his worry and increases production.

BIGNALL & KEELER are on the job in hot as well as cold weather, keeping their line of pipe threading machines strictly up-to-date.

The latest improvements are the sliding type of die-head with locking adjustment that insures duplicate threads without danger of variation, and the special slide for victaulic and other grooving operations.

These features added to the heavy, dependable BIGNALL & KEELER machines keep them well up in the front rank. They are worthy of investigation.

PEERLESS BEK O

Bignall & Keeler Machine Works, of the N.O. Nelson Mfg. Co. EDWARDSVILLE, ILLINOIS





4 B range ½ to 4" 5 D range

#### SAUNDERS' MOTOR DRIVEN Pipe Threading and Cutting Machines

Recommended for Plumbing and Steamheating work or for Industrial Plants either as a Portable or Permanent installation.

Fermanent installation.

Equipment: Constant
Speed Motor for either alternating or direct current,
with reversing drum type
controller, two Adjustable
Expanding Die-heads to
thread the range of each
machine, oil pump, reaming and cutting-off attachments. ments.

Bel driven also; sizes 1/4 to 18".

D. SAUNDERS' SONS, Inc. 23 Atherton St., Yonkers, N.Y.



PRESSES-Foot and Power WIRE FORMING MACHINES-Standard and Special. TUMBLING BARRELS-BALL BURNISHING EQUIPMENT AUTOMATIC CHUCKING MACHINES.

THE BAIRD MACHINE CO. BRIDGEPORT, CONN.



# HYDRAULIC MACHINER'

HIGH QUALITY HYDRAULICS

HYDRAULIC MACHINERY

Forming Presses

> Forcing Presses

Forging Presses

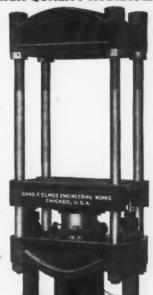
Testing Presses

Extrusion Presses

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SPECIAL MACHINERY

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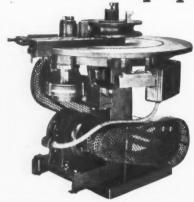
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Charles F. Elmes Engineering Works 222 N. Morgan St. Hydraulic Machinery "Since 1851"

# Pedrick Equipment Speeds Up Pipe Bending



Any kind of tubing—iron, copper, brass, steel, galvanized pipe—can be bent *cold* with a Pedrick Horizontal Pipe Bender — cold and *unfilled*. No distortion — no crinkles, flatness or cracking of the outside coating. And more production than you've ever thought possible!

Pedricks are made in sizes to handle pipe from ½" to 4"—any bend up to 180°. Ask us for circulars.

#### Pedrick Tool & Machine Co.

3639 N. Lawrence St., PHILADELPHIA, PA.

# The New Curtis Pipe Cutting and Threading Machine

Heavy pipe he'd stationary while light dies revolve—the natural method of pipe threading.

Low power consumption — hand operated where power is not available.

Minimum floor space required.

Light weight—take your machine to the work rather than heavy pipe to the machine.

Cuts bends and crooked pipe readily.

Motors concealed within base and protected from oil, chips and breakage.

Write for full details.

HAND - BELT - ELECTRIC MODELS

Portable 2, 3 and 4 Inch Others 6, 8, 12 and 16 Inch



#### AND CURTIS CO.

Pipe Cutting and Threading Machines

324 Garden St., Bridgeport, Conn. Find out about wide dies



ATLAS POWER ARBOR PRESSES

### SPEED!

—and plenty of it for all classes of broaching, straightening and forming work. Atlas Presses are also capable of that powerful, accurate, measured stroke essential for gear and bearing assembly jobs. SKF Bearings throughout. No longer-lived presses are built—and few are as economical.

The No. 50 Atlas 10 Ton Press illustrated (arranged for line shaft drive) is only one of a wide selection of sizes and models.

THE ATLAS PRESS CO. KALAMAZOO, MICH.



No. 442 Motor Driven Pipe Cutting and Threading Machine, range 1-4" R.H.

The
ROYERSFORD
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Co., Inc.
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#### ROYERSFORD PUNCHES AND SHEARS

"Sells" Roller Bearings.
Commercial Roller Bearings.
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Excelsior Drills 10", 14", 20".

Roller Bearing Tumbling Mills.

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#### **Minster Power Presses**

Inclinable—Horning—Straight Side— Knuckle Joint—Gap and Screw Presses

THE MINSTER MACHINE CO. MINSTER, OHIO, U. S. A.

Automatic Punch Press Feeds

F.J.LITTELL PEED MACHINE CO.

4125 Ravenswood Av. CHICAGO



## Bending "In Great Quantities" with a Buffalo Bending Roll

Add The Standard Tank Car Corp., Sharon, Pa., to the long list of Buffalo Bending Roll endorsers!

Their bending roll is used to bend angles for dome heads on insulated cars—material 1½" x 1½" x ½" angle iron.

The radius of the complete part is 6 ft., and it is turned out in "great quantities" at the rate of 12 per hour, which is mighty good production!

Representative plants like this almost invariably choose Buffalo Bending Rolls for this type of work; they know the Buffalo trade-mark on a machine means fast, precise and economical work. If you have a bending problem we'd be glad to submit estimates to your prints. Or ask us for catalogs.

# Buffalo Forge Company, 144 Mortimer St., Buffalo, N.Y.

IN CANADA: Canadian Blower & Forge Co., Ltd., Kitchener, Ontario.

BENDING ROLLS—WRAPPING ROLLS—PUNCHES—SHEARS—DRILLS

"We are exceptionally well satisfied with the results we have obtained."

That is the voluntary compliment of the American Twist Drill & Tool Co., of Detroit, for

## ETNA SWAGERS



One Etna Swager in operation at the plant of the American Twist Drill & Tool Co., of Detroit.

This machine is swaging taper shank twist drills at the rate of 250 per hour, replacing the old method of butt-welding high speed steel to shank steel. Production was increased and costs reduced.

Write for estimates on equipment to fit your needs.

## The Etna Machine Co.

Toledo, Ohio



Production Engineering — Consulting — Designing
O. C. Kavle, L. W. Moulton and Staff of Associate Engineers and
Designers—Known as

Manufacturers' Consulting Engineers
McCarthy Building, SYRACUSE, N. Y.

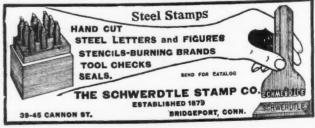
DRIVE RIVETS
COLD

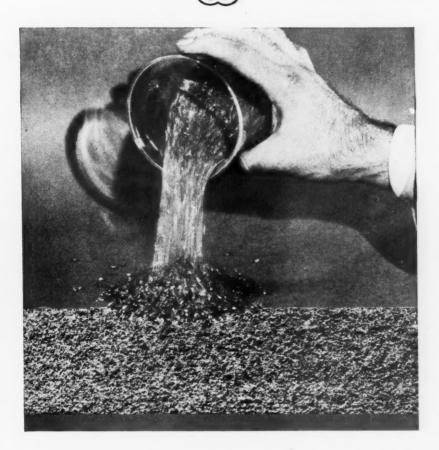
HANNA RAPID RIVETERS



HANNA ENGINEERING WORKS 1763 Elston Ave. Chicago, III.







# THE GRIT MUST BE RIGHT, OF COURSE, BUT SO MUST THE BOND

Abrasive wheel strength and service depends upon the bond. The introduction of the resinoid bond has set a higher standard of strength, speed and efficiency for abrasive wheels in many grinding operations.

A resinoid bond makes an exceptionally strong, long-wearing abrasive wheel, that runs cool at all speeds, does not gum, and gives off no offensive odors. It may be operated at speeds of 9,000 s.f.m. with safety.

Resinoid bonded abrasive wheels and discs are widely used for snagging, cut-off, and for other grinding operations, including automatic and semi-automatic grinding. Abrasive wheel manufacturers will gladly study your grinding operations and recommend the most efficient equipment and wheels for your work.

Abrasive wheels bonded with resinoids made by Bakelite Corporation are produced by all the leading manufacturers. Names on request.

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THE MATERIAL OF A THOUSAND USES

# COLONIAL RED STAR



A Carbon Tool Steel
CELEBRATED
FOR ITS
UNIFORMITY

A GOOD STEEL FOR You

COLONIAL STEEL CO.
PITTSBURGH, PA.

Thousands of these tiny clock parts are turned out rapidly and smoothly with Carpenter Stainless No. 5

Carpenter

NO NEED TO ADJUST OR SLOW UP THIS STAINLESS MACHINES TO USE STEEL

O not continue to think that, in order to use Stainless Steel, you must change this or that or the other thing in your machines. For in Carpenter No. 5 you can have a stainless steel that machines, grinds and polishes just as easily as ordinary screw stock. No need to change your cutting angle. No need to slow up. No special adjustments. No loss of production time.... And, best of all, finished products made of Carpenter Stainless No. 5 frequently cost no more than if made of ordinary steel and plated.

Consider these true statements carefully. Verify them—and they will mean even more to you. Samples to test on your own machine will be sent promptly for the asking . . . just tell us the kind of samples you need.

THE CARPENTER STEEL COMPANY, READING, PA.

Licensees Under Patents of the American Stainless Steel Company

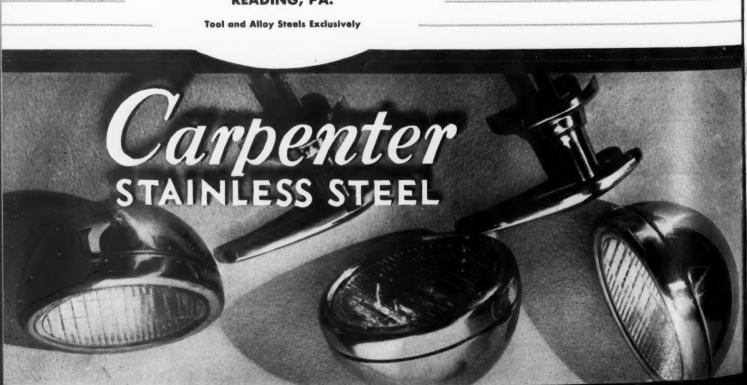
# FOR EXTRA OPERATIONS TO USE THIS STAINLESS STRIP STEEL . . . .

HERE is a stainless steel that gives you all the good qualities you want without burdening your production with all the expensive extra operations so usually considered necessary when working with stainless steel.

Carpenter Stainless Strip is possessed of a uniform dead softness that makes it ideal for deep drawing or difficult stamping operations. And it is so inherently fine in character that its surface is surprisingly free from pits and imperfections, buffing to a smooth satin finish with a minimum of time and cost.

This strip is available in both straight chrome and in 18-8 chrome nickel grades—and samples of either will be sent you upon request so that tests can be made in your own shop—and proof given that these claims are *not* exaggerated. Send for them.





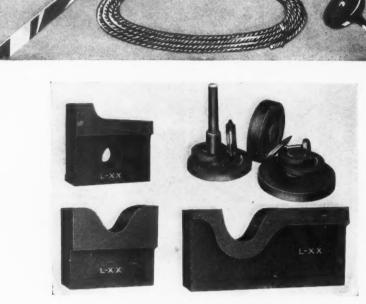
Since Jugust
Torty-one years
of continuous

of continuous operation have given this organization a broad and extended experience it has been recognized as the highest authority in the manufacture, application and utility of steels in cold



UNION DRAWN STEEL CO.

MACHINERY, August, 1930—193



Tire-turning tools and cutter blanks.

# DROP FORGINGS OF HIGH SPEED STEEL

THE LUDLUM STEEL COMPANY has a specially equipped plant for producing high speed steel forgings suitable for side mills, keyway cutters, end mills, involute cutters, hobs, angle cutters and other special tools. The saving in weight when using forgings frequently offsets the extra cost of the forging, to say nothing of the saving in time and labor charges.

These forgings are made from selected L-XX High Speed Steel billets of uniform analysis, and are furnished annealed ready for machining. In all cases the blanks are cross-forged. The refinement of structure shown by these forgings, particularly in large sizes, is impossible of attainment in bar stock. Likewise tools made from these forgings are vastly superior in strength and performance.

We make a specialty of forged railroad tire-turning tools which are furnished annealed or finish-machined, hardened and ground ready for use. We are also prepared to make up discs and forgings of high speed steel of special shape or design to meet individual requirements.

Let us send you the Ludlum Tool Steel Catalog giving applications and treatments for the entire Ludlum line.

LUDLUM STEEL COMPANY TOOL AND SPECIAL ALLOY STEELS



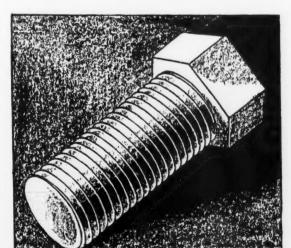
WATERVLIET AND DUNKIRK, N. Y. NIROSTA, NITRALLOY & STRAUSS METAL

# NCREASED PRODUCTION

NCREASED production and lowered costs accompany the adoption of Carnegie Manganese Steels. This group of steels is composed of numerous grades suitable for various purposes and their excellent quality is the result of many years of manufacturing experience. In many cases they are substituted for more expensive steels at a considerable saving, without loss of efficiency in the finished product.

Carnegie Carbon Manganese Screw Stock, one of the grades in this group, is a low carbon, high manganese, high sulphur steel, particularly suitable for threading or other high speed cutting. Its free-cutting qualities closely approximate Bessemer Screw Stock and insure a long tool life and continuous machine operation. Many automatic machine operators prefer it to Bessemer on account of its consistent uniformity. Suitable heat treating and case hardening develop a fine grained, uniformly hard case and tough ductile core. The high manganese content insures a clean steel and aids in carbon penetration. The desired depth of case is thus secured in shorter time at carburizing temperature, resulting in increased production and savings in fuel and pot costs. Other grades of this type are obtainable in carbon ranges up to .50% where higher physical properties are important factors.

These Carnegie Carbon Manganese Screw Steels are furnished to many



prominent shafting concerns who use them to supply their customers' requirements for high quality products. We invite you to make a comparative test with the steel you are now using.

3

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation PITTSBURGH, PA.

CARNEGIE CARBON MANGANESE STEELS

# HAWKRIDGE

## STEELS and SERVICE

Quality Steels and a Willingness to Help

A simple base on which to build a big steel business? Perhaps—but it is on this foundation that Hawkridge has built and grown.

We have quality steels for every steel fabricating purpose; we know steels and we make it our business to keep our knowledge up to date; and most important of all we are ready to help any steel user in New England by supplying the steel, the information, the service he needs to insure his satisfaction in this important metal.

If your plant is in New England let's get acquainted.

HAWKRIDGE BROS. COMPANY 303 CONGRESS STREET, BOSTON, MASS.



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High Speed Steel
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QUALITY PRODUCTS

Dependable



# Spur Gear Cutter

## Redesigned—Improved for "Better than Ever" Gear Production



Newark Gear Cutting Machine Company Henry E. Eberhardt, Pres. 69 Prospect St., Newark, N. J. Phone-Market 2-7725



Production speed, quality, costs—the triple gage by which machine efficiency is measured shows a high scale of achievement in the improved and redesigned Newark Line.

Entirely automatic operation—no attention is required after the machine is set up and the cut started—is only one factor that reduces production costs with this redesigned Newark No. 5 Spur Gear Cutter. Other features that increase production efficiency—as the patented Long Cutter Carriage, the patented Column Support, patented Centralized Control, etc., insure characteristic Newark efficiency — a step ahead of today's demand, ready for tomorrow's requirements.

Use the coupon for details of the Newark line of Gear Production Equipment, and the Newark No. 0 Improved Cutter Sharpening Machine.

Makers of Gear Cutting Machinery for 26 years

#### NEWARK GEAR CUTTING MACHINE CO., 69 Prospect Street, Newark, N. J.

Gentlemen: Please send me copies of your circulars on:

The Newark No. 55 Spur Gear Cutter, max. dia.— 48"

The Newark No. 5 Spur Gear Cutter, max. dia.— 72"

The Newark No. 7 Spur Gear Cutter, max. dia.-100"

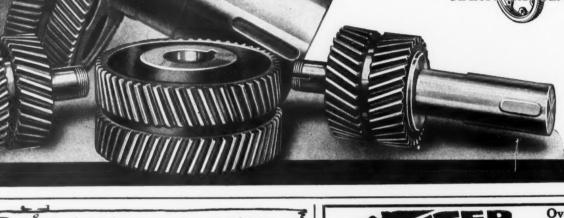
The Newark No. 3 Gear Hobber, max. dia.— 18" max. dia.— 72" The Newark No. 5 Gear Hobber,

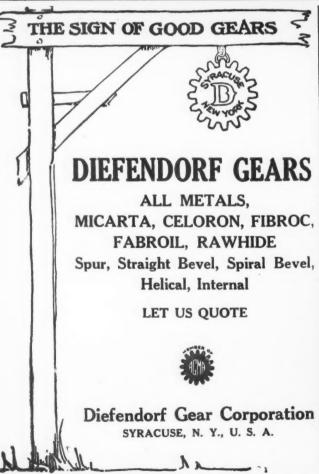
The Newark No. 0 Improved Cutter sharpening machine.

Address......Position......

HARTFORD GEARS











## IT'S NEW!

**WHS Catalog No. 24** 

Showing a complete line of Speed Reducers of Small H. P. capacity, including prices, line cuts and dimensions.

Send for your copy

WINFIELD H. SMITH, INC. 116 Eaton Street Erie Co., N. Y.

Springville

# 24 HOUR DELIVERY

on

# Micarta Gears

TWENTY-FOUR hours for Micarta gears is the customary delivery provided by gear cutters in emergencies. Gear manufacturer-distributors are enabled to give this quick service on Micarta gears because they can carry Micarta in stock indefinitely without deterioration. Micarta is unaffected by moisture and oil, and will neither expand nor dry out. It is not attacked by rodents. These qualities also enable you to carry finished Micarta pinions and gears in stock to meet any breakdown need.

Micarta gears may be obtained in any tooth design and in any thickness up to ten inches in a single piece. They require no end plates for ordinary applications. Where oil, moisture, grit, and acid fumes are encountered, Micarta gears have a far longer service life

than other non-metallic gears; and under shock and vibration, they render quiet, lasting service unapproached by cast-iron, bronze or untreated steel gears. Write to any of our gear manufacturer-distributors for interesting gear information.

#### Micarta Gear Manufacturer - Distributors

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Chas. C. Steward Machine Co. CALIF. Los Angeles Keystone Engineering Company

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Works

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WASH. Seattle Western Gear Works

# Westinghouse

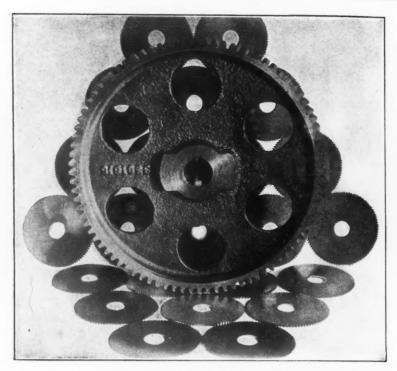


#### A GEAR WITH A BACKGROUND

Tells a story—

The reliability of the concern back of the product





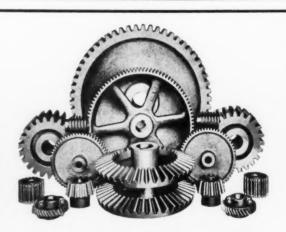
places Insurance on the Life of your Machines.

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Policy



Massachusetts Gear & Tool Go. 34 Nashua St. Woburn Mass.





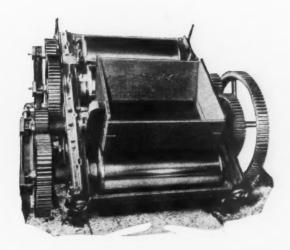
## MADE RIGHT

Our product is made the same way yours is made—to the same fine standards of precision, dependability and workmanship. This kinship recommends Cincinnati Gears as logical equipment for your product, with a further recommendation of reasonable price and good service.

Why not send us your prints for an estimate? There's no obligation involved.

#### THE CINCINNATI GEAR CO.

1825-1841 Reading Road, CINCINNATI, O.



# A phrase of significance in industry:

#### "GEARS BY EARLE"

Machinery for the process industries has to stand up under severe usage. Such vital parts as *gears* must be carefully chosen for their endurance and quiet running qualities.

That is why the Houchin-Aiken Company, Inc., of North Hawthorne, New Jersey, manufacturers of soapmaking machinery, selected EARLE GEARS for installa-

tion in the equipment shown above.

Every Earle Gear has over a quarter century's experience and the accumulation of patterns, tools, etc., behind it which results in a gear designed to meet your individual requirements at no greater cost than that of the ordinary stock gear if you are lucky enough to find one.

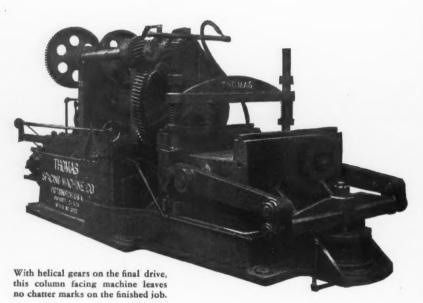
May we prove this on your next gear order?

#### The Earle Gear & Machine Co.

4709 Stenton Ave., Philadelphia, Pa.

95 Liberty St., New York 110 State St., Boston, Mass.
117 King St., Melbourne, Australia
26 Charles St., London, Eng.
c/o Andrews & George Co., No. 5 Shiba Park, Tokyo, Japan

# for SMOOTHER QUIETER drives



# ...WN helical gears

WESTINGHOUSE-NUTTALL helical gears can always be depended upon to transmit power smoothly and quietly.

Protection is thus afforded against excessive power losses, unnecessary abuse of equipment, boosted maintenance expense and faulty operation which invariably occur where there is vibration and noise in the gear drives.

This smooth, quiet operation of Westinghouse-Nuttall helical gears is due to their gradual tooth contact. Because of this, the load is transmitted progressively and gradually in uniform amounts from

tooth to tooth rather than by a series of sharp, sudden impacts. As a result, teeth never ridge, regardless of wear, thus prolonging gear life and permitting the use of a new pinion with a worn gear, or vice versa, without impairing operation.

Westinghouse-Nuttall helical gears can be supplied in any size or design up to 162 inches diameter and 1 DP.

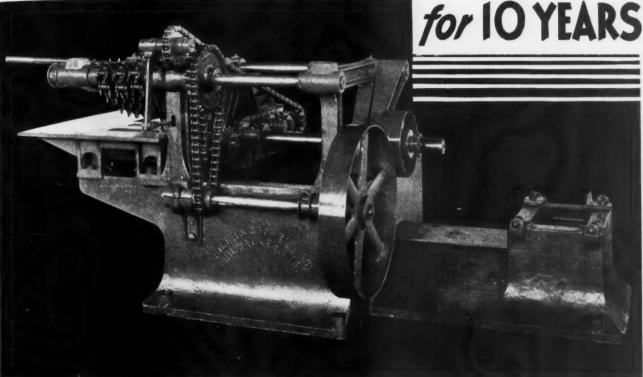
Bulletin 60 fully describes these gears. Copies are available at the nearest Westinghouse sales office.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

### Westinghouse



# FILER AND STOWELL CO. A user of CULLMAN SPROCKETS





This motor driven lath bolter shows clearly the extended use made of Cullman sprockets in saw mill machinery by the Filer & Stowell Co., Milwaukee. Ten years of use must mean satisfaction.

This company is typical of many concerns which have used Cullman sprockets over extended periods and have found them accurate—dependable—less costly.

Cullman sprockets will always maintain the high standards of your equipment.

Send for Catalog No. 15. Just out. Contains much useful information.

CULLMAN WHEEL CO.

1339 Altgeld Street, Chicago, Ill.

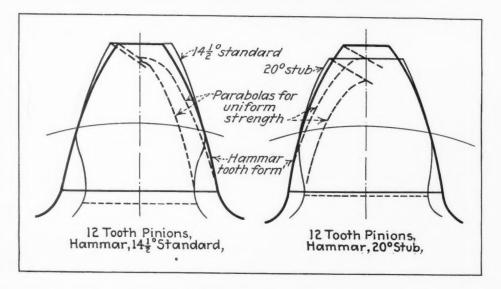
SPROCKETS—SPEED REDUCERS—ELECTRIC PUMP DRIVES

## CULLMAN SPROCKETS

For ultimate design economy....

### HAMMAR TOOTH FORM GEARS

PATENTED IN U.S.A., CANADA & FOREIGN COUNTRIES



HAMMAR TOOTH FORMS are designed to provide smaller, stronger and better gears than the present involute systems.

Other reasons why Hammar Gear Teeth will appeal to both the designer and user of gear driven products:

- 1. Greater strength.
- 2. Full involute tooth.
- 3. Better rolling action—less slip.
- 4. Greater contact angle.
- 5. Pitting and wear minimized.
- 6. Stronger under impact loading.
- 7. Adapted to high pitch line velocity.
- 8. Pinions with small number of teeth.
- 9. Larger reduction ratios in single train.
- 10. Pressure angles constant.

Without obligation, you are welcome to call upon us to help you solve any gear drive problem.

HAMMAR 16 STATE STREET



COMPANYING.



long life.

The "TITAN" line is available with either Herringbone or Helical types, whichever best suits your special requirements. Call on our Engineering Department to get the relative merits of these two types as they apply to your special job.

Seventy Years of Engineering Experience Is Behind the "TITAN" Line

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111 N. CANAL ST. Dept. 37 CHICAGO, ILL.

Sales and Engineering Offices in All Principal Cities U. S. A. and Canada



MACHINERY, August, 1930—205

Hindley Worms and Worm Gears

Drag-free-Power Saving

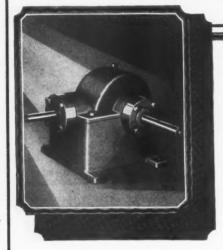
The economy of Hindley Worms and Worm Gears is a fact—based on an exclusive proven design. Hindley Gears have wider tooth faces, greater tooth contact, hence pressure per square inch of contact is far less. High frictional resistance, drag and overheating are eliminated—Hindley power transmission is more efficient, power costs are greatly reduced.

#### HINDLEY GEAR COMPANY

504 North 19th Street, PHILADELPHIA, PA.



Hindley Speed Reducers are made in many sizes with Hindley Worms and Worm Gears. Efficient, dependable, lasting.



BEVEL
GEAR
REDUCTION
UNITS—
SPIRAL
GEARS—
SPECIAL
GEARS—

Engineered to transmit power at minimum cost. There is long experience behind them.

Grant Catalog Sent upon Request

Complete line of Grant's stock gears carried by Kline & Dreisbach, 151 No. 4th St., Philadelphia, and The Adam-Hill Co., 244 Ninth St., San Francisco.





WORKS

#### Simonds Cut Gears DOUBLE - D

All Metal & Silent Gears

Your next order for silent pinions should be for the

#### **D D SILENT STEEL PINION**

SPUR-BEVEL-MITER & WORM GEARS and RACKS. CUT TEETH.

The Simonds Manufacturing Co. 25th Street PITTSBURGH, PA.

#### GEARS-As You Want Them

—and When You Need Them

Latest Equipment— Efficiently organized for Service.

Water Pumps, Oil Pumps, Governors and Other Complete Units Machined and Assembled to your specifications.

Let Us Quote on Your Requirements

#### Hein-Werner Motor Parts Corp.

formerly
Milwaukee Circulating Pump Co.
Waukesha, Wisconsin, U. S. A.



#### The Adams Gear Hobber and Thread Miller

An Accurate, Versatile and Highly Productive Machine. Ask for Circular.

THE ADAMS COMPANY Dubugue, lows, U.S.A.



#### Gears and Gear Cutting

We guarantee satisfaction

RODNEY DAVIS PHILADELPHIA, PA. Scientific
Construction
Explains
the
Performance
of



Two size 1561 Type V. T. Worm Gear Reducers driving agitators mounted on base plate with 15 HP motors. 1200 RPM—Ratio 45 to 1.

# Philadelphia speed reducing units

(DNE NAME-ALL TYPES)

A cross section of a Type V. T. Worm Gear Reducer showing the construction of the worm shaft, bearings, etc. Have you sent for a copy of our new Reducer Catalog? Write us on your business letterhead



PHILADELPHIA, PENNA.

New York, 12 E. 41st Street Pittsburgh, Pa., Farmers Bank Bldg.

Correct in design and construction—that's why PHILADELPHIA UNITS give such excellent SERVICE. The right metal is selected for the gears and shafts, according to the type. Heat treating and accurate machining give longer life and trouble free operation. Dust, dirt, and moisture-proof housings eliminate trouble. In short—Philadelphia Reducers are, as they have often been called, the "units of no repair parts."

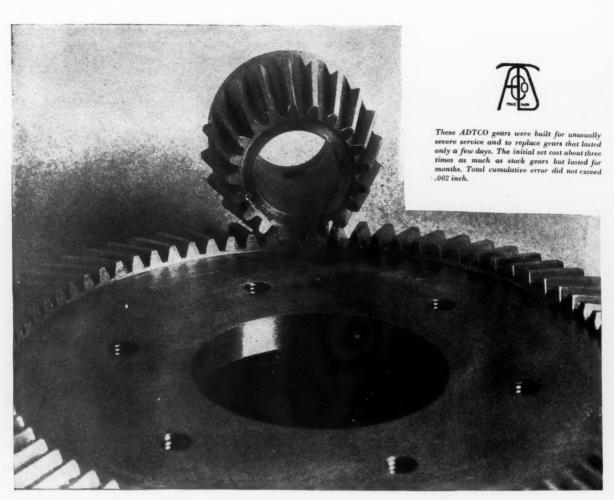
#### PHILLIE GEAR

#### **Speed Reducers**

are the ideal drive for:

Line Shafting
Rotary Kilns
Turn Tables
Screw Conveyors
Belt Conveyors
Individual Machine Drives
Rotary Dryers
Crushers
Mechanical Stokers
Elevators
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#### users of precision and special gears—only

IF EFFICIENCY AND DURABILITY ARE NOT IMPORTANT, YOU WILL NOT BE INTERESTED

**▼**F precision gears—special gears—or 1 quantities of accurate gears—are what you require, we can meet your specifications regardless of how exacting they may be. The wide diversity of the precision jobs entrusted to us during the past 25 years, insures the accuracy specified by you - or the solution of your problems - quickly and economically. Users of precision and special gears -

both in this country and abroad - have found it so. ·

Falk Sp tios fi 518:1; standar 3/8 to 100 R.

specia

Correct alignment — the lack of which, like gear inaccuracy, may reduce the efficiency of gearing by from 5 to 50 per cent\* - is insured by accurately controlled machinery.

If long wear is an important factor, it is insured by the care and skill exercised in heat treating.

\*Kent's Handbook, 10th Edition, Page 1668.

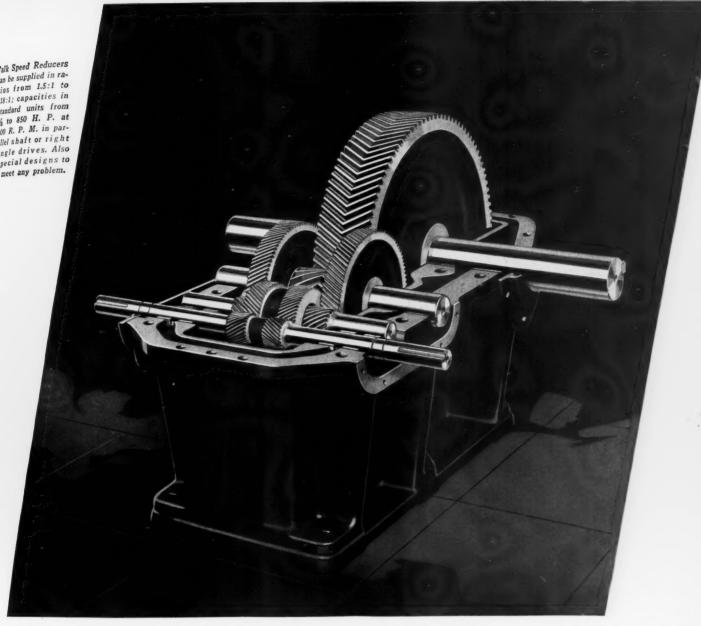
#### AMERICAN DIE & TOOL CO.

Manufacturing - Engineering - Designing - Machining Gear Cutting - Heat Treating - Grinding Over 25 Years' Experience

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Falk Speed Reducers can be supplied in ratios from 1.5:1 to 518:1; capacities in standard units from % to 850 H. P. at 100 R. P. M. in parallel shaft or right angle drives. Also special designs to



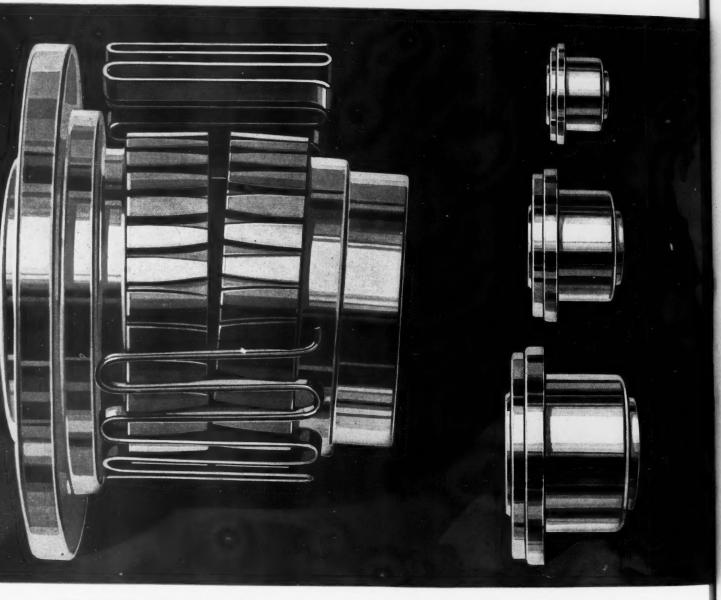
#### Sturdy — to Handle Industry's Heavy Loads

Falk Speed Reducers in actual service have established the high average of 961/2% to 981/2% efficiency in power delivery depending on number of reductions — an efficiency that is maintained throughout the life of the reducer . . . This is due to the high standards of Falk manufacturing precision . . . Falk Speed Reducers are simple, compact, oil-tight, dirt-proof, quiet, free from heat or vibration. They permit a higher reduction per gear, and transmit load and transform speed with less friction loss than any other type or kind · · · They are made in standard sizes and ratios in both parallel shaft and right angle types and carried in stock for immediate shipment · · · For speed reducers — as for all heavy equipment — you will find it pays to see Falk first!

#### Scientific Speed Reducers

Scientific design allows equal pressure on bearings, prevents uneven wear and misalignment. All wearing parts are interchangeable and renewable . . . Patented splash system of lubrication assures long life . . . Excessive capacity makes it unnecessary to buy oversize reducers . . . There are no male or female shafts, bushed gears or overhung studs all shafts are live shafts.





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Falk Flexible Couplings — all-steel — are scientifically constructed to transmit power without stress or strain . . . Because of their spring and groove construction, they permit a greater degree of lateral and torsional resiliency than any other coupling compensating for angular and parallel misalignment . . . These two features assure smoother, more dependable operation and longer coupling life . . .

Falk Flexible Couplings provide widest distribution of pressure, allow most correct lubrication, float freely under load, give greatest resistance to overloads, absorb shock and vibration, operate equally well in either direction, either end can be the driver . . . Falk Flexible Couplings can be furnished from stock in capacities from 1/5 to 18,000 H. P. For special requirements up to 26,000 H. P.

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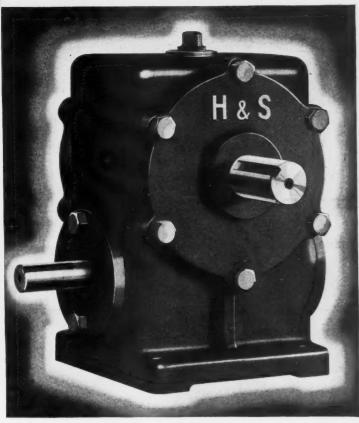
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N such difficult service as the manufacture of steel, brick, cement . . . in damp, dusty and dirty locations, you will find Horsburgh & Scott Worm Gear Speed Reducers serving faithfully year after year.

To the complete line of large-size units has now been added two smaller Worm Gear Speed Reducers for use with fractional horsepower motors. They have the same ruggedness . . . the same reliability that characterizes the large H & S Reducers.

These new units are made in ratios from 5 to 1 to 60 to 1. The worm is forged integral with the shaft, making the transmission rigid, strong and true running at all speeds.

These smaller units are especially recommended for transmission of power to table rolls of steel mills, for opening and closing doors and for driving conveyors of all types where the greater power of the larger units is not required.



Our engineers will gladly cooperate with you in the solution of your transmission problems, recommending the type, ratio and capacity of unit that will give you best results.

Write for our complete Speed Reducer Catalog.

The Horsburgh & Scott co.

GEARS AND SPEED REDUCERS Cleveland, U.S.A.

#### Spiral Gears

are easy on a

#### **BOLENDER**

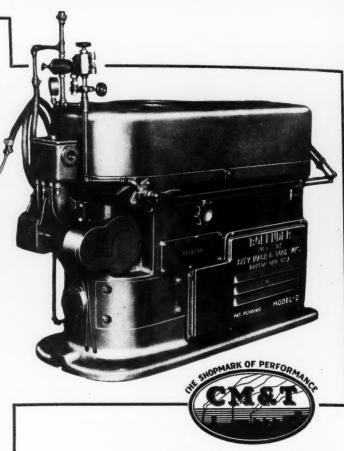
With the modern trend toward quietness in the transmission of power, spiral gears are coming into more common use.

The Bolender is easily arranged for burnishing spiral gears and turns them out accurately at speeds worth investigating.

The simplicity of this compact machine both in construction and operation and its wide range of application are amazing. It will cost you nothing to get fully acquainted with all the possibilities of this husky gear burnisher. Write for literature or ask for a representative to call and tell you all about the Bolender.

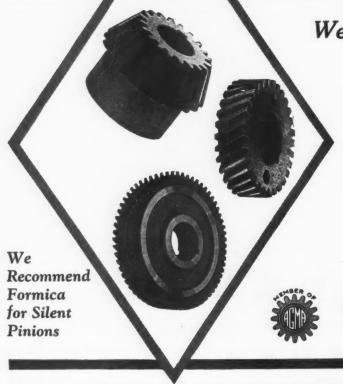
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Other C M & T products include the Bolender Gear Grinding Chuck and Peerless Gear Chamfering Machine.

### **GEARS BY CROFOOT**



We Build These Gears to Stand the Gaff

> —and they've been standing it for more than 20 years, on every kind of application.

We offer a combination that's hard to beat—at prices hard to equal. Long experience, fine quality, highest accuracy and a plant modernly equipped and expertly manned to handle orders of any quantity for gears of any kind, in sizes from 1/8" to 36"—all metals and Bakelite. We'll rest our case on an estimate.

Charles E. Crofoot Gear Corp. 65 Central St., SOUTH EASTON, MASS.



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— these Pittsburgh Gears are up against a mighty tough job — and as usual, handling it successfully.

The queer looking machine is a coal loader that does its stuff 'way underground in the coal veins. The space it works in is mighty cramped, and the burden placed on its thirty gears is a heavy one. All of them, of course, are Pittsburghs, of a special analysis steel, heat-treated, and they've stood the gaff for six years without breakdown or any appreciable wear. Other makes of gears formerly used failed to stand this service test.

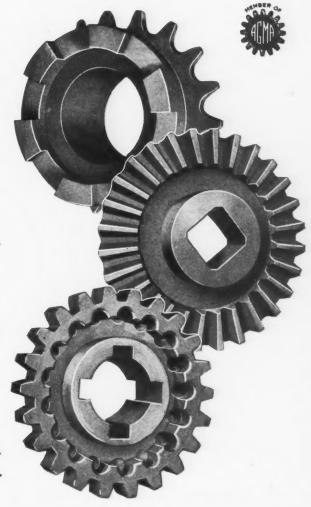
What is your tough gear job? We'd like to estimate on it.

#### Pittsburgh Gear & Machine Co.

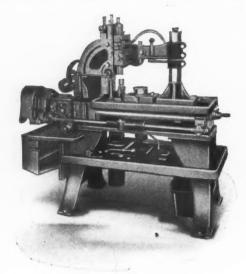
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We are distributors for the General Electric Co. and can give 48-hour service on Fabroil and Textolite Gears.



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The Whiton No. 14—to cut spur, bevel, worm gears to 32" diameter. Send for details of the Whiton Line.

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Fully Automatic Gear Cutting Machines

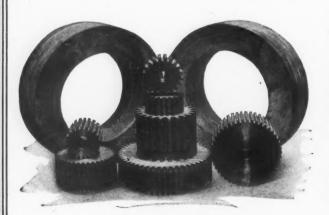
Tool rooms, machine shops, contract shops, find plenty of use for a Whiton Automatic. Easily set up, fast, accurate, it operates efficiently on large or small lots and is invaluable where gear production constantly varies both in type and quantity.

#### The D. E. WHITON MACHINE COMPANY

NEW LONDON, CONNECTICUT



#### Standard—on the country's leading machines



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We know of no greater endorsement for Stahl Gears than their choice by many of the country's leading machine builders. These manufacturers have proved by every known method the superior accuracy, stamina and economy of Stahl Gears. Proof for them is proof for you.

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LIST OF PRODUCTS: Metal gears—spurs up to 72" dia., 1½ D.P.; bevels up to 54" dia., 1½ D.P.; spirals and herringbone gears up to 48" dia., 2 D.P.; worm gears up to 48" dia., 2 D.P.; racks 12' long, 3 D.P. Rawhide gears any requirement up to 15" dia., 1½ D.P. We also manufacture Bakelite Pinions. Ask for complete details.

THE STAHL GEAR & MACHINE CO.
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#### PERMIT THE SHAFTS TO PASS

of the gear and pinion to pass, allowing answering modern day requirements as to speed, accuracy and quietness.

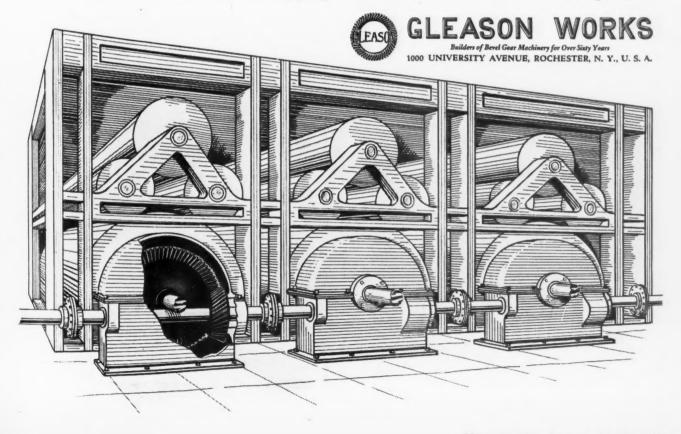
These features, plus the advantages of rapid production and moderate cost, are all found in Hypords.

By a new method, the pinion of the pair is correctly generated in the same offset position in which it is to operate when in use. Hypoids have the same overlapping

FOR YEARS, designers have sought a tooth action found in Spiral Bevels and will drive which would permit the shafts transmit heavy loads with maximum efficiency. They are extremely quiet and any desired reduction, and at the same time smooth in operation and the tooth wear is practically negligible.

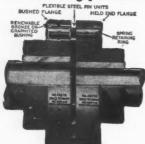
> Hypoids have been used for several years in automobile drives where they have been proved under the most exacting and severe conditions. They are daily going into more extensive use in other fields.

These gears are now available in sizes up to 60 inch pitch diameter. Complete information on them will be sent on request.



For Motors, Turbines, Engines

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All metal. Durable. Flexible in all directions. Spring cushion for load shocks and vibrations. Endwise displacement. Easy means to line up shafts. Reversible. Noiseless. No backlash. No movement or wear on flanges. Interchangeable parts. Easily assembled. A size for any load, speed or power. Low cost and maintenance. tenance.

More important than the first cost - and many use FRANCKES because they cost so little—is the fact that provision has been made for quickly, easily and cheaply renewing parts without even moving the flanges.

The steel flexible pin units are locked in place by a spring retaining ring and these pin units are free to move endwise within bushings in the other flange. No movement on either flange.

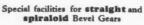
Almost as simple as a rigid coupling but effectively handles accidental shaft misalignments and cushions load shocks.

SMITH & SERRELL, 62 Washington St., Newark, N. J.





All Types of Gears, also SKEW BEVEL GEARS





CHAIN DRIVES

BEVEL SPUR SPIRAL WORM SPROCKETS RAWHIDE BAKELITE AND HARDENED STEEL PINIONS
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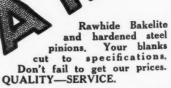
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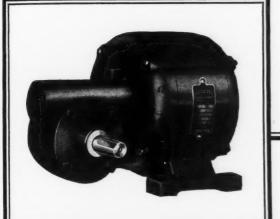
### TN DESIGNING SLOW-SPEED MOTOR DRIVEN APPARATUS

Let your first thought be of JANETTE  ${\it Motorized}$  SPEED REDUCERS.

In fact, design your entire machine around these units. You'll find that by so doing you can simplify your whole design, while making your machine more compact as well as more economically assembled.

JANETTE *Motorized* SPEED REDUCERS combine a motor and speed reducer in one compact unit, eliminating many assembly operations when mounted on motor driven apparatus.

They embody genuine JANETTE Ball-Bearing Motors which may also be obtained *without* Speed Reducer attachment.



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Whether on a delicate instrument or dirty, oily drive a universal joint leads a tough life. But Atlas Universals are built to "stand the gaff"—their parts fit close; wearing surfaces are casehardened, and there are no small screws or sharp corners to catch abrasive dirt. Atlas Joints are most economical.

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In the spotlight! That is the place Braun occupies. Why? Because Braun gears and Braun service have proved themselves through the years.

Braun cuts every type of gear, in any material or quantity, and delivers promptly—twenty-four hour service on Westinghouse Micarta. Braun *individualizes* its services, produces gears that meet the customer's peculiar needs.

Among the company's patrons are many of the largest machinery users—all of whom will readily and enthusiastically testify to the reliability of Braun gears. Write for further information.

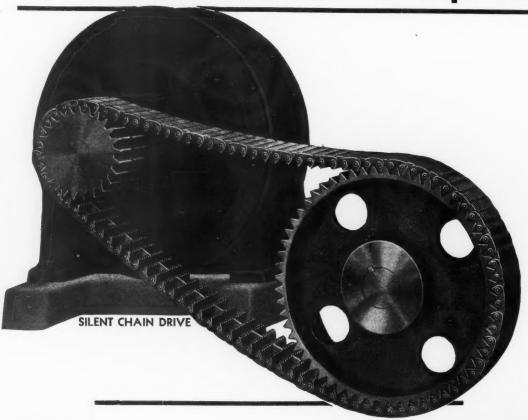
"For Gear Breaks-Call Braun Gear"

#### BRAUN GEAR CORPORATION

1323-5 Gates Avenue Brooklyn, N. Y.

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for the efficient transmission of power





Herringbone Speed Reducers

Sykes tooth form gears. Quiet and efficient in operation, withstanding severe shocks. Speed ratios up to 300 to 1. Popular sizes carried in stock. Catalog.

Link-Belt makes a positive drive for every class of power transmission service. These drives include Silent Chains, Herringbone Speed Reducers, Roller Chains, Worm Gear Speed Reducers, Steel Chains, Malleable Iron Chains, Herringbone Gears, and the P. I. V. Gear (Variable Speed Transmission). Each of these drives has its own range of service within which it will operate with utmost economy, and Link-Belt Positive Drive Specialists are equipped to help you select the correct one for your particular power transmission needs.



Herringbone Gears

A full continuous tooth which
gives greater strength and bearing surface than teeth of any other
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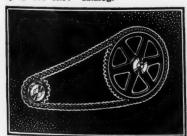
THE Link-Belt Silent Chain Drive, for example, transmits power without slip on short centers, and accordingly is one of the most widely accepted mediums for driving from the prime mover. It delivers by actual test 98.2% of the energy of the driver to the driven shaft. In its unfailing service the Link-Belt Silent Chain Drive is "Flexible as a belt, positive as a gear, more efficient than either."

Equally efficient in their respective fields of use are the other Link-Belt drives shown here. Every unit in this complete line is a dependable drive that will not slip. Every one is positive. Every one represents the highest development of modern engineering and manufacturing skill.

All of these positive drives are built and backed by Link-Belt—an engineering organization that has served and grown with American Industry since 1875. Let Link-Belt equip you now with the information that will help you buy drives giving the most reliable and economical service. Use the coupon below. It will bring to you one or all of the data books covering the Link-Belt line of positive drives.

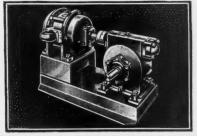
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For moderately high speed power transmission. It is next in efficiency to Link-Belt Silent Chain. Distributors carry stock drives up to 100 H.P. Catalog.



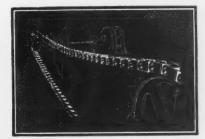
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For light or heavy duty drives on cast tooth wheels. Complete range of chain drives shown in General Catalog.



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Our research has revealed processes by which you can easily and unmistakably determine what

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218—MACHINERY, August, 1930

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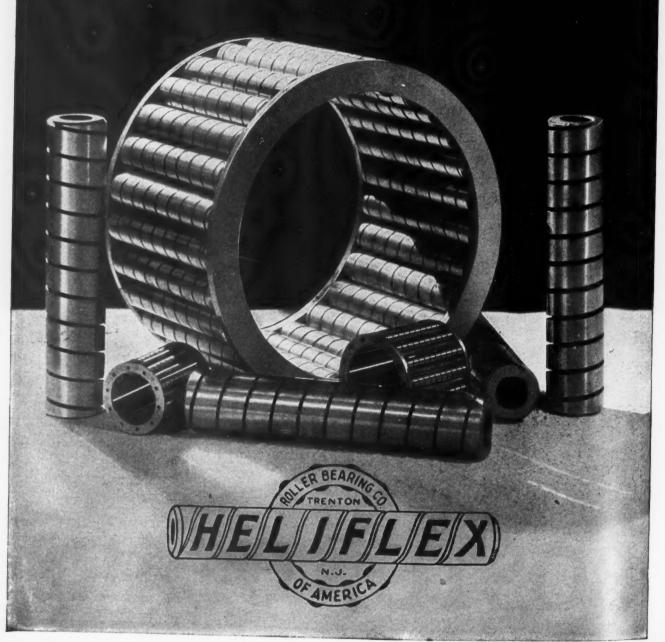
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# BEARING COLONAL AMERICA TRENTON, N. J.



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Bulletin No. 37

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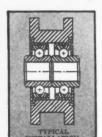
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ABEARING for every purpose and any duty. Small bearings. Large bearings. Bearings made to your B. P. S., or stock bearings. In other words, you can obtain "COMMERCIAL" Annular Ball Bearings to exactly meet your requirements. Speeds up to 2500 R.P.M. and the famous three point contact. These bearings are used in thousands of widely diversified products and are recommended to those who want a good bearing at moderate price.





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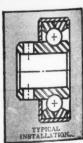


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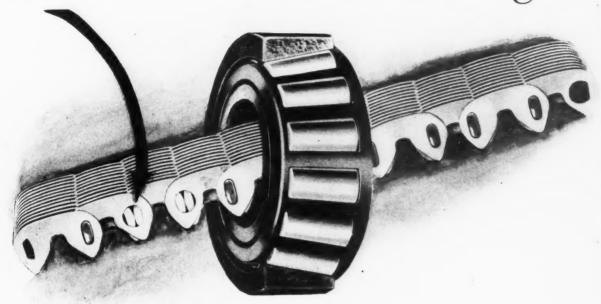
THE SCHATZ MANUFACTURING COMPANY, Poughkeepsie, N.Y.

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for Every Purpose



### Smooth as a Roller Bearing



Just as the inner and outer races of a roller bearing are separated by a roller for the purpose of eliminating friction, and prolonging life, so are the links of all Ramsey Silent Chains separated by a joint based on the principle of a roller bearing.

The patented Ramsey Roller Bearing joint, consisting of two pins with convex surfaces, roll upon each other, tending to eliminate friction in the joints of the chain as it passes over the sprockets. This causes a smooth action not found in any other kind of chain transmission.

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The Perfect Oil Retainer insures long life to the bearings it protects. And long life is characteristic of the Perfect Oil Retainer itself.

Scientifically designed springs maintain uniform pressure of the leather packing member against the shaft.

Effective sealing excludes moisture, dust, metal particles and abrasives, and prevents lubricant-leakage.

Specially processed leather—the result of 52 years' tanning experience—resists for many years the harmful action of mineral lubricants and of heat.

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contained assembly, consist-ing of leather packing mem-ber, spring and steel retainers -the Perfect Oil Seal offers the utmost in installation economy, lubricant-retaining efficiency and bearing protection.

### PERFECT OIL RETAINER

# BEARINGS CANNOT BE HAD...

o matter what the price..

THE steel that goes into these bearings is the finest high carbon chrome steel. Each bearing is made with utmost care and precision. Every operation is checked. Every bearing part tested and calibrated. The most minute inspection follows every step in processing. The result is—a bearing of unusual quality giving better service and capable of sustaining the name and reputation of FEDERAL RADIAL BALL BEARINGS.

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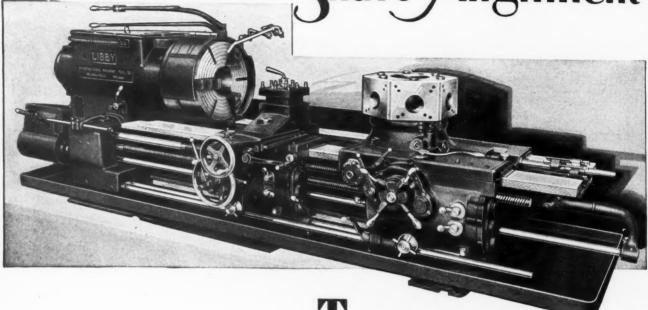
THE FEDERAL BEARINGS COMPANY, INC. POUGHKEEPSIE, N. Y.

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Uses Strom Ball Bearings to preserve Shaft Alignment





he new Libby-International Model H Turret Lathe is a heavy, rugged machine designed to give the utmost efficiency in working with the new high-speed cutting tools on modern alloy steels.

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4563 Palmer St. - - CHICAGO, ILL.





Send for details of Edgemont Clutches.

Single adjustment by hand (no tools required). Hardened steel cam and rollers that eliminate wear. Asbestos metallic liners that require no oiling and are easily renewable.

#### EDGEMONT SF DISC CLUTCHES

insure constantly efficient service at any speed.

Made in a complete line of pulleys with oil sleeve bearing, ball bearings and Timken Roller Bearings. Also made in extended sleeves and cut off couplings.

#### THE EDGEMONT MACHINE COMPANY

2700 National Avenue,

DAYTON, OHIO





#### ABBOTT STEEL BALLS

for Bearings and Burnishing Also "Abbott Ball Burnishing Barrels"

The ABBOTT BALL COMPANY 1045 New Britain Ave., Hartford, Conn.

#### AUBURN ENCLOSED THRUST

SELF-CONTAINED

Answers the dusty locations problem.

Write for list of sizes.

AUBURN BALL BEARING CO. 73 Clarissa St., ROCHESTER, N. Y.



No Springs or Rubber in

#### NICHOLSON FLEXIBLE COUPLINGS



Using centrifugal force—no springs or rubber to break or deteriorate—Nicholson Couplings are durable; heat treated, correctly lubricated, with ample compensation for misalignment and ample allowance for lateral float, they give efficient service under difficult operating conditions.

> Bulletin 329 gives complete details of this efficient piece of modern shop equipment.

W. H. NICHOLSON & COMPANY WILKES-BARRE, PA. 112 OREGON STREET

#### HARTFORD

"UNIVERSALLY DEPENDABLE"

#### BALLS FOR BEARINGS

High Carbon Chrome Alloy Steel Carbon Steel Balls

BRONZE, MONEL METAL, ALUMINUM STAINLESS STEEL

Write for Size and Price List

THE HARTFORD STEEL BALL CO. HARTFORD, CONN., U. S. A.

#### The BANTAM BALL BEARING CO.

South Bend, Ind.

JOURNAL - - THRUST - - RADIAL

Ball and Roller Bearings ½ to 40 Diameter "One or a million"

CHICAGO

Finished Stock Bronze Bushings Bronze Bushings to Blueprints Cored and Solid Bronze Bars

The Buckeye Brass & Mfg. Co. 6410 Hawthorne Ave., Cleveland, O.



# The ESSENTIAL FACTOR

of anything that moves is the agency that controls this motion.

To design and build an excellent machine at great expense, in time and money, and then inflict upon it a mediocre start, go and stop—is ridiculous.

A clutch is a little thing in space occupied and cost expended, but it's the prime mover of your machine, nevertheless. Each movement, each stop, each overload peak, is registered through the friction clutch. It's the pulse of the whole throbbing sensitive assembly of units, making up a machine.

There is a

#### "Last Word in Friction Clutches"

It's the CONWAY DISC, with enclosure, balance, centripetal action, power capacity, easy engagement, instant release and drag-free idling.

An attractive little clutch, huskily constructed and accurately machined through 72 painstaking operations.



Have you the Conway Catalog P-20?

It's the book you can buy out of without a slide rule or a calculating machine.

The Conway Clutch Co.

1547 Queen City Ave., CINCINNATI, OHIO
"The Conway Disc is a splendid Clutch"



#### CLUTCH BY HILLIARD-a Selling Point!



Sales will come easier when your customers know that your product is Hilliard-equipped. The 24 years that Hilliard Clutches have been featured on every type of industrial equipment has established the name as a valuable selling point.

Let our engineers show you how to install this better clutch-made to your requirements-at extremely reasonable cost. No obligation.

THE HILLIARD CORPORATION, Elmira, N. Y.

Cushion heavy shocks—lengthen machine life with



### BROWN

ated driving springs and

#### **Resilient Coup**

They absorb sudden shocks and jars and simultaneously correct shaft misalignment. Only resilient couplings like Brown offer this double protection. Brown Couplings have heavy laminated steel springs working in taper-sided slots; these resilient "shock absorbers" relieve your delicate machine parts from sudden strain, minimize repair expense and delay, and add years of life to both motors and driven machines.

Full data on request.



BROWN **ENGINEERING** COMPANY

133 North 3rd Street READING, PA.

#### Now...It's a One Man Job

Three men were formerly required to lift the heavy motor illustrated. Now, ONE MAN and a Canton Portable Floor Crane do the same job far more quickly, safely and economically. Capacity up to 6000 lbs. Friction Load Brake holds load in position, prevents accidents. Users say: "Canton Portable Floor Cranes are the biggest time savers in our shop."

Write for Details

Canton Foundry & Machine Co. CANTON, OHIO New York Office: 154 W. 57th St





#### Poole Flexible Couplings

End your coupling troubles forever

No Pins No Springs No Bushings No Rubber or any other material to flex and crystallize

Free End Float Lubricated Heat Treated Forged Steel Throughout **Dust Proof** Oil Tight

Catalog?—Yes—Your request will bring it promptly. No obligations

Poole Engineering & Machine Co. BALTIMORE, MARYLAND

#### Heavy Duty Roller Thrust Bearings



STANDARD DIMENSIONS or to ORDER. ONE OR ONE THOUSAND

The Gwilliam Company

360 Furman St., Brooklyn, N. Y. Send for Catalog



# 180 LIFTS A DAY for 10 years and STILL GOING STRONG!



THAT'S the service record to date of this Shepard LiftAbout at The Manhattan Rubber Manufacturing Co. It is serving calenders with 1000 to 1800 pound rolls of rubber... saving time and labor.

Maintenance has been negligible. Practically the only attention a Shepard needs is lubrication and that, too, requires only a minimum of time because of Shepard's "oil bath lubrication."

Fumes, dirt and moisture cannot penetrate the tightly sealed enclosure which houses all vital parts of Shepard Electric Hoists "Balanced" drive, rigid alignment and unit construction provide strength and stamina to resist the unavoidable abuse of modern handling.

Many time and labor saving applications of hoists are described in the Shepard book of "Illustrated Economies." A copy is yours for the asking



SHEPARD NILES CRANE & HOIST CORP.

Main Office: 380 Schuyler Ave., Montour Falls, N. Y.

Works: Montour Falls, N.Y., and Philadelphia, Pa.

SHEPARD CRANE & HOIST DIVISION

THE MOST COMPLETE LINE OF



CRANES & HOISTS IN AMERICA

MACHINERY, August, 1930-231

# CAST-IRON-PULLEYS-

## Specially Designed for Your Job

Cast-iron pulleys by T. B. Wood's are made specially for the job, each a special design particularly adapted to the work in hand.

Your requirements will be better met with such pulley equipment, and it will cost you no more than stock pulleys far less suitable to the conditions in your plant.

Wood's Cast Iron Pulleys are machine molded, turned true, bored true, run true and stay true.

#### T.B. WOOD'S SONS COMPANY

Chambersburg, Penna.

Cambridge, Mass.—Greenville, S. C.

Write for Descriptive Catalog





—Peerless gears "are stronger" because they are cut — not cast — of alloy heat treated steel, exactly as in automobile transmissions. . . . They have to be stronger, because we guarantee them for five years against abnormal wear or break! Look for this guarantee when buying a hand chain hoist.

Write for Bulletins.

THE HARRINGTON COMPANY
PHILADELPHIA



#### Lift Electrically

Why pull—tug—strain and waste your time with slow lifting methods when the

ROEPER TYPE "R" Electric Hoist will do the work twenty times as fast?

The price is surprisingly low. Send for Bulletin.
ROEPER CRANE & HOIST WORKS, Inc.

Member of Electric Hoist Manufacturers Association 1740 N. 10th Street, READING, PA.



#### **Face While Boring**

M-D Facing Head can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6" to 30". Write for prices.

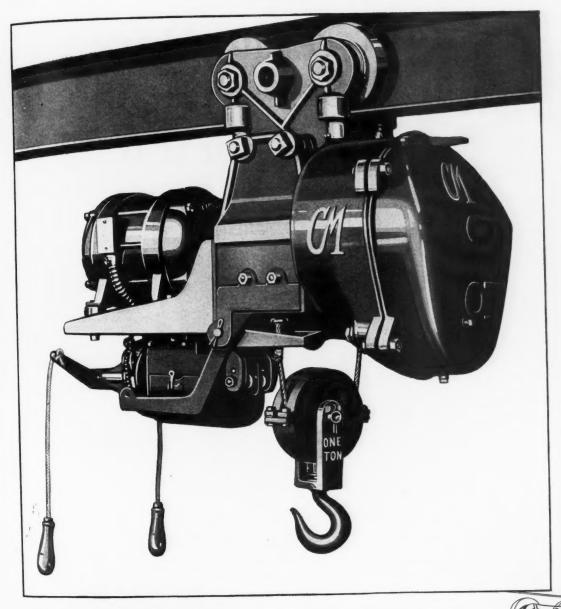
MUMMERT-DIXON COMPANY HANOVER, PA.



BARRETT TRUCKS

AND STEELEG PLATFORMS

BARRETT - CRAVENS COMPANY 3269 W. 30th Street - - - CHICAGO



#### HOISTING at Lower Cost

THE "C-M" Electric is very simple in construction... Easy access to all parts.. Readily adjusted. It's built for hard service and is foolproof in operation.

Simplicity of design! This, probably, the greatest quality a hoist can pos-

sess. For upon simplicity hinges its usefulness, and its economy in maintenance.

The "C-M" Electric is unusually simple. A minimum of parts go into its construction, and the function of each of these is readily perceived. There's nothing complicated about this long-lived, hard-working hoist. Indeed, by the removal of only four bolts, these parts which receive the heaviest wear are made immediately accessible. By taking out two more bolts, six in all,



every part of the hoist is free for inspection. In disassembling, there are no keys to be pulled... Here's a saving for you, in hours of maintenance labor!

The ruggedly built hoist mechanism is enclosed and runs in oil...

The load is controlled constantly by a Weston Type brake... Any standard hoisting motor may be applied... Let us mail you full details about this "C-M" HOIST that will save TIME and LABOR and reduce your maintenance expense account. Write!

CHISHOLM - MOORE HOIST CORP. (Division Columbus-McKinnon Chain Corp.) 5038 Fremont Ave. In Canada: St. Catharines, Ont.

CHISHOLM MOORE
CHAIN HOISTS

ELECTRIC HOISTS

CHICAGO

1)

PITTSBURGH

NEW YORK

PHILADELPHIA

CLEVELAND

MACHINERY, August, 1930-233

# For Your Protection OILGEAR Reg. U.S. Pat. Off. This trade-mark appears on the name plate attached to the pump name plate attached to the pump unit of every genuine Oilgear Feed.

This Drive is SMOOTH AS OIL —for it is oil

The "Bridgeport Hydraulic" Face Grinder at left is equipped with Oilgear Table Drive and Wheel Feed. The work table traverse is driven by a reversible, variable speed Oilgear pump which insures the right, pre-established and adjustable work speed without shock or besitation. The grinding wheel ged is by Oilgear and is instantly set to desired amount.

HE smooth, positive force of oil under pressure is the power behind Oilgear Machine Feeds. There is no chatter, no vibration, no torsional stress—just steady, cushioned pressure, at predetermined speed . . . with speed under instant control.

That is why Oilgear performs the most exacting operations with marked accuracy and economy. Take, for example, face grinding. True economy and gratifying production are obtained by light cuts and many passes in rapid succession. In addition, proper work speed varies widely for different materials and conditions. An Oilgear table drive is the ideal means of meeting these requirements. Because of its cushioned driving characteristics it accelerates and reverses heavy loads with cost-cutting speed and smoothness.

Also the correct grinding speed is instantly obtained without the slightest shock or jar.

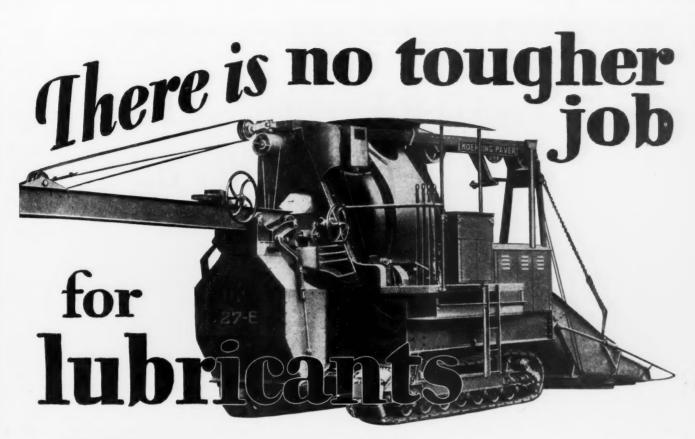
If you are interested in improved feeds for any machining operation, write for Oilgear Feed bulletins which contain full information.



OILGEAR
THE PERFECT MACHINE FEED
(A-1660)



234—MACHINERY, August, 1930



WHERE could there be a tougher job for iron and steel—or for lubricants?

Sand—grit—cement—water—weather; and, in addition, the most gruelling kind of driving service; running day in and day out—starting—reversing—hoisting—traveling.

When the Koehring Company produced the new 27-E paver—the latest and finest mechanism of its kind—they lubricated it throughout with Delco Lubricants.

Experience with Delco in other units had given them so much added *service capacity* that there was no question about the lubricants for the 27-E.

Delco users are convinced that it doesn't pay to take a chance with greases and oils that are not "built for the job" — that have less of specialized lubricating experience behind them.

If you have a tough lubricating job—Delco Special Greases and Oils will do it—well. Tell us about it. We'll be frank with you in our recommendations.

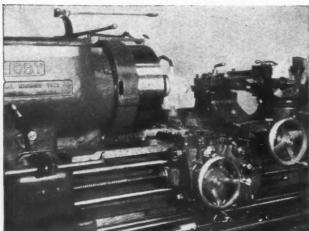
LINDSAY-McMILLAN COMPANY, Milwaukee, Wis.

Branches: DETROIT, DULUTH, MINNEAPOLIS





# FASTER WORK ... BETTER On practically all types



Courtesy of International Machine Tool Co. Indianapolis, Ind.

OPERATION: TURNING AND DRILLING CROSS HEAD PIN.

MACHINE: 3H. LIBBY TURRET LATHE.

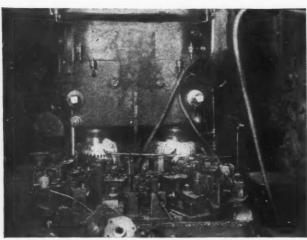
MATERIAL: .45 CARBON STEEL.
TOOLS: CARBOLOY.

STOCK REMOVED: 2 INCHES.

FEED: 1/6 INCH. SPEED: 125 R. P. M.

LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.

Courtesy of Warner Corporation Muncie. Ind.



OPERATION: SURFACE MILLING STEERING GEAR CASES.

MACHINE: NEWTON NO. 50 VERTICAL MILLER. MATERIAL: MALLEABLE IRON.

CUTTERS: 12 INCH DIAMETER, INSERTED TOOTH, WIDTH OF CUT: 11 INCHES.

DEPTH OF CUT: 1/8 INCH.

SPINDLE SPEED: 65 R. P. M.-180 S. F. P. M.

FEED: 24 INCHES PER MINUTE.

PRODUCTION: 144 PIECES PER HOUR.

LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.

BALTIMORE BRIDGEPORT BUFFALO CHICAGO CINCINNATI

**EMULSIFYING** 

Made by SUN OIL CO. producers

DETROIT FLINT GRAND RAPIDS HARRISBURG JACKSON, MICH.

236—MACHINERY, August, 1930

WHATEVER the nature of metal parts you manufacture—let it be gears, nuts, bolts, ball-bearings or small typewriter parts-whether your equipment consists of lathes, millers, threaders, slotters or grinders-if you work in brass, bronze, copper, aluminum, machine screw stock, high carbon or alloy steels or monel metal. you will find the Sun Oil Company produces cutting lubricants of outstanding efficiency for your work.

In Sunoco Emulsifying Cutting Oil, for instance, you have available a lubricant most widely and favorably known in the trade for its aid in producing faster work with better finish at lower costs. A roll call of Sunoco users reads like a "Who's Who" of the metal working industry. It has long been our privilege, as it is now, to show typical examples of how Sunoco is serving efficiently and economically in leading metal cutting plants.

SUN OIL COMPANY, Philadelphia, U.S.A.

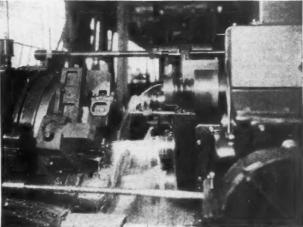
# FINISH...LOWER COSTS of metal or machines

IN your own shop, SUNOCO Emulsifying Cutting Oil will:—

- 1. Mix easily and stay mixed.
- 2. Be an ideal refrigerant as well as lubricant.
- 3. Act as perfect rust preventive.
- 4. Prevent system from clogging.
- 5. Require less frequent cleaning of the system.
- 6. Permit higher speeds and heavier cuts with better finish.
- 7. Never turn rancid, for it contains no animal or vegetable fats.
- 8. Prove to contain no rosin or rosin oil.
- 9. Keep workmen's hands in better condition.

SUN OIL COMPANY ENGINEERS have offered many valuable suggestions at no cost to manufacturers for increasing outputs and lowering production costs. Prompt and intelligent attention is given to all inquiries addressed direct to Headquarters or to any of our branches.

Courtesy of Warner Corporation, Muncie, Ind.



OPERATION: DRILLING, REAMING, SPOT FACING AND TAPPING STEERING GEAR CASES.

MACHINE: GOSS & DE LEEUW AUTOMATIC.

MATERIAL: MALLEABLE IRON.
SPINDLE SPEED: 200 R. P. M.
FEED: 240 FEET PER MINUTE.
TAP: 2 INCH DIAMETER, 16 PITCH.

PRODUCTION: 180 PIECES PER HOUR.

LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.

Courtesy of Foote Bros., Gear and Machine Co., Chicago, Ill.

SUN OIL COMPANY, Ltd., Montreal, Canada.



JACKSONVILLE MIAMI MONTREAL NEWARK NEW YORK

OTTAWA PHILADELPHIA PITTSBURGH

QUEBEC QUINCY READING ROCHESTE SCRANTON SYRACUSE TAMPA

TORONTO TRENTON TULSA WILMINGTON



OPERATION: GRINDING GEAR BLANKS, 18 AT A TIME.

MACHINE: BLANCHARD SURFACE GRINDER, 26
INCH ONE-PIECE MAGNETIC CHUCK.

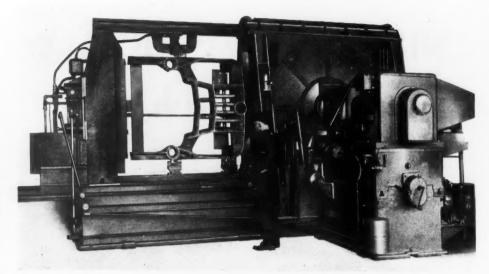
MATERIAL: SOFT STEEL.

WHEEL: NORTON SILICATE
16 INCH X 5 INCH X 1½ INCH.

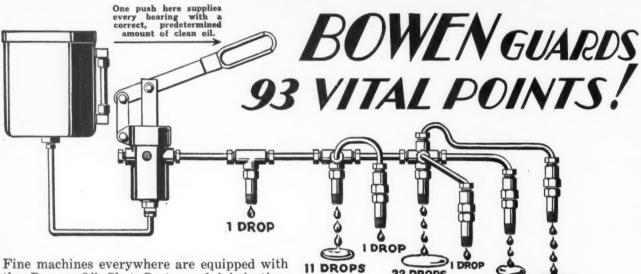
WHEEL SPEED: 1000 R.P.M.

LUBRICANT: 1 PART SUNOCO TO
40 PARTS WATER.

# On the World's Largest Double Grinder—



This huge Besly Grinder, weighing 35 tons, is specially equipped for grinding large cast iron boiler sections. It is double spindled, with two grinding wheels, each six feet in diameter. It is lubricated by three Bowen Oil Shot Lubricating Systems.

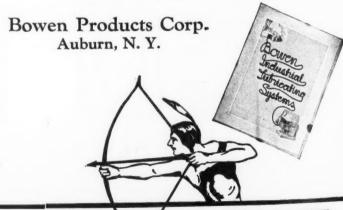


Fine machines everywhere are equipped with the Bowen Oil Shot System of lubrication. It's highly flexible, simple and adaptable to almost every type of equipment.

Measured in terms of economy, the Bowen System is an indispensable feature of all modern high speed machines. Both the hazards and expense of hand oiling methods are removed and a positive system substituted which provides the adequate, measured lubrication so essential to modern day machines.

It pays to feature equipment that saves on your product—equipment that eliminates shut downs and repairs, stops oil waste and immeasurably increases machine efficiency. That's why more than 50 leading machine builders have standardized on the Bowen Oil Shot System!

Submit your lubrication problems to Bowen's trained Lubrication Engineers—send today for this Bowen book on Industrial Lubrication, M 8-72.



**Positive Lubrication** for Industrial Machines BOWEN SUSTEM

# In Ten Thousand Industrial Plants



ANTIQUATED oil-hole and grease-cup lubricating methods must go. With present high-speed production comes a more careful scrutiny of manufacturing costs—and here the Alemite High Pressure Lubricating System plays a most important part. Its widespread, constant growth clearly points the trend.

Intense competition in all fields of industry has placed a premium on production maintenance and the reduction of overhead costs. Hence, universal approval of this modern lubricating plan that matches modern machinery and modern manufacturing methods.

Alemite solves all lubricating problems. Today, in ten thousand plants, Alemite High Pressure Lubrication is increasing production—cutting operating costs. They find that it brings longer life to expensive machinery, greater efficiency and freedom from repairs. This translates directly into money saved in labor—in lubricants—in protection to materials in process.

Since its inception, Alemite has met progress with progress in the industrial world. In recognition of the tremendous advantages offered by this new method of lubrication, more than 1100 leading manufacturers of machinery are now using Alemite as standard equipment on their products. For Alemite gives a protection service never before possible.

The benefits of this modern lubricating plan are available to you at once. You need not wait for new machinery—it is a simple matter to modernize your present equipment as far as lubricating goes. A remarkably small investment puts your plant on a systematic basis that plugs production leaks.

An Alemite System for every need is quickly and easily installed, whether for button head, pin, push or dot type fittings. There can be no wasted lubricant with this system, and bearings are cleaned of all grit and dirt when they are lubricated.

This positive lubricating system ends the costly inefficiencies of oil soaked floors and machinery—of break-downs that cut into production. It saves losses in damaged materials. Even substantial reductions in power costs are effected.

Write today for complete details of the savings now made possible by Alemite.

Alemite Corporation (Division of Stewart-Warner), 2678 N. Crawford Ave., Chicago, Ill.

# ALEMITE

High Pressure Lubrication for Modern Industry

ALEMITE CORPORAT			f Stewart-	Warner)				
Please send me complet	e details	of the	avings nov	w made po	ossible	by Al	emite	e.
Firm Name								
Address								
Your Name								
City			State					238

#### **BROWNIE COOLANT PUMP**

Simple—Sturdy—Efficient
A Trouble-Proof Coolant Pump!

THIS improved HOPKINS Brownie Coolant Pump is especially adaptable for centerless grinders. A centrifugal pump, it uses no pack-



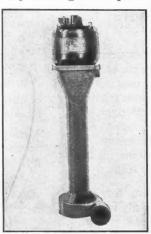
ings and will not clog. No bottom or pan under impeller to collect grit or chips. Drive shaft, impeller and protector tube are one unit, revolving together. With intake at top, coolant is never forced upward between housing and protector tube, and never comes in contact with ball bearings, which are within 1" of impeller (the latter being entirely self-aligning).

No. 1 has a capacity of 50 gallons per minute with a maximum lift of 15 feet, a ½ H.P. motor, used with direct motor drive, and a speed of 1725 R.P.M. The height overall (which may be changed) is 195%" including motor, and pump can be placed in an 8½" diameter circle. Outlet pipe is 1¼".

No. 2 pump has a capacity of 15 gallons per

minute; a maximum lift of 10 feet; a ½ H.P. motor; a 1" outlet pipe; height 19½" including motor.

THIS pump handles a heavy mixture of coolant with grit and chips as efficiently as it does clean oil. Furnished with or without motor, or with driving pulley, if desired. It can also be furnished in Acid-Resisting Metal.



ma	il Today
1	TOMKINS-JOHNSON CO., Jackson, Mich.
Name Addres	State
City .	



#### PUMPS for PERMANENT SERVICE

Non-clog construction insures nonwearing permanently efficient pump service with a constant ample flow of coolant.

Fulflo Pumps are simple, practical, efficient and economical.

Cuts show the Fulflo Motor Driven Grinder Pump, capacity 25 gallons at 1800 R.P.M.

Also made in other sizes and capacities.

Send for details of Fulflo Belt and Motor Driven Pumps.



#### Fulflo Specialties Co.

Blanchester, Ohio, U.S.A. Manufacturers of Fulfio Pumps



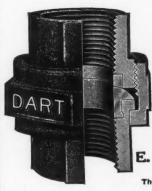
### ALES BEGIN AT THE DESIGNER'S TABLE!

That is why so many of the country's leading machine tool manufacturers find it profitable to include the

# GUSHER COOLANT

as standard equipment on their best machines. It pays to sell GUSHER equipped machines.

The Ruthman Machinery Co.



#### DART

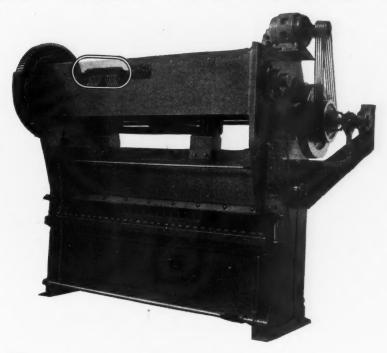
The logical pipe joints!
Clean, accurate threads
and Two Rustproof
Bronze to Bronze seats
positively prevent leaky
joints.

A complete line of Unions, Tees, Flanges and Ells. Send for samples.

E. M. Dart Mfg. Co. Providence, R. I.

The Fairbanks Company, Sales Agents
Canadian Factory:
Dart Union Co., Ltd., Toronto

### MADISON-KIPP FRESH OIL SYSTEM



# . . for all wearing parts on the Chicago Steel Forming Press

All wearing parts of the Chicago Steel Forming Press, manufactured by the Dreis & Krump Manufacturing Company, Chicago, are protected by the Madison-Kipp Fresh Oil System.

Each bearing gets just the right amount of fresh oil, delivered unfailingly by the accurate metering system of the Madison-Kipp Lubricator.

The machine lasts longer, because Fresh Oil cuts down friction and wear during the incessant up and down trips. Production is increased because no operating time is lost for oiling or for shutdowns due to faulty lubrication.

Madison-Kipp Machine Tool Lubricators are adaptable to all types of machine tools. They can be furnished in sizes and types to fit into any machine tool design.

We will be glad to send you special information covering a wide variety of machines.

#### MADISON-KIPP CORPORATION

203 Waubesa Street, Madison, Wisconsin LUBRICATOR DIVISION

Manufacturers of Air Grinders, Fresh Oil Systems, Mechanical Lubricators, Die Casting Machines, Die Casting Dies

See also pages 71-104



# Is your shop big enough to take this extra profit?



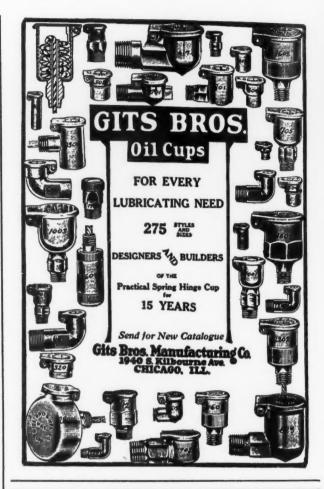
In all shops, small and large, chips carry about the same proportion of oil. The average is about 2 gallons per 100 pounds. Can you afford to let that good cutting oil get out of your shop?

Big shops, turning off tons of chips a day, can't afford it. With a battery of Tolhurst Chip Wringers they take those tons of chips and whirl every possible drop of oil out of them. They recover the oil -- and they recover it at the lowest cost per gallon.

This same profit is waiting for all but the very smallest shops. Tolhurst Chip Wringers are made in two types, in four sizes. Let us show you how one of these machines will fit your shop, give you the cheapest cutting oil you've ever had. The coupon will bring a preliminary report, without obligation.

# TOLHURST Chip Wringers

the facts on Tolhurst	orks, Inc., 645 W.Fulton St., Troy, N.Y. Please give me Chip Wringers. We handle aboutpounds of chips is We prefer (line-shaft) (individual) drive.
NAME	330033033=============================
COMPANY	
ADDRESS	***************************************





#### "HOBART"

Equipment for Cleaning Materials in Process of Manufacture

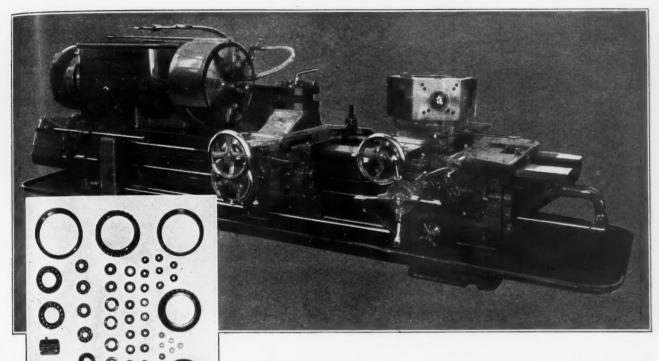
INDUSTRIAL WASHER DIVISION
THE HOBART MFG. CO. TROY, OHIO

#### **COLT AUTOSAN**

METAL PARTS CLEANING AND DRYING MACHINES

See our full page ad in last month's issue—send for complete new catalog—AS-115

COLT'S PATENT FIRE ARMS MFG. CO.
Autosan Machine Div., HARTFORD, CONN.



# Modern machines need modern lubrication....

MACHINE tool design has made great advancements during the past few years. For instance, there is a vast difference between the turret lathe of ten years ago and the modern "Libbie" Heavy Duty Turret Lathe shown here. Ball and roller bearings have replaced plain bearings. Gears, feed, spindles and all moving parts have been radically improved, many new features have been added.

Improvements in machine design have demanded similar improvements in lubricants and lubrication methods. The lubricants used in modern machines must be modern also ... must have the qualities to meet present day

conditions. It is significant that such organizations as the International Machine Tool Company who manufacture and operate modern machinery use Standard Oil Company (Indiana) lubricants.

Investigation will show you why so many progressive concerns use S. O. C. I. lubricants. It will prove to you that these lubricants are modern. It will give you conclusive evidence that your machinery will operate as its manufacturers intended it to, if proper S. O. C. I. lubricants are used. Call in one of our lubrication engineers. His recommendations, if followed, will assure you of getting lubrication that is modernized completely

#### STANDARD OIL COMPANY (Indiana)

General Offices: 910 South Michigan Ave.

Chicago, Illinois



Billings Cheyenne Chicago Davenport Decatur Denver
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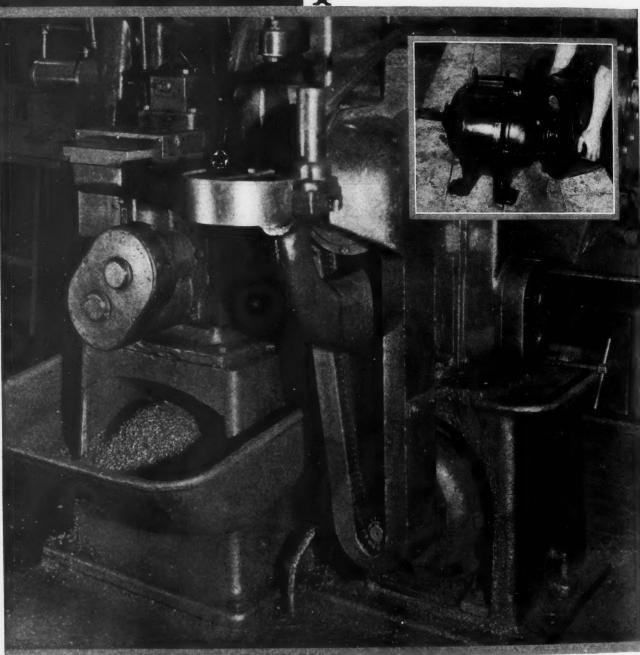
1108

LUBRICANTS FOR ALL INDUSTRY

MACHINERY, August, 1930-243

# Save **Machine Cost**

24-hour production schedule required four machines to do the job because at intervals of less than two weeks the motors were shut down by magnetic dust locking the rotor. A Wagner Air-jacketed Motor and this machine were substituted and now 24-hour operation goes on month after month with no shut-downs and one machine does all the work...Don't let motors limit your production.





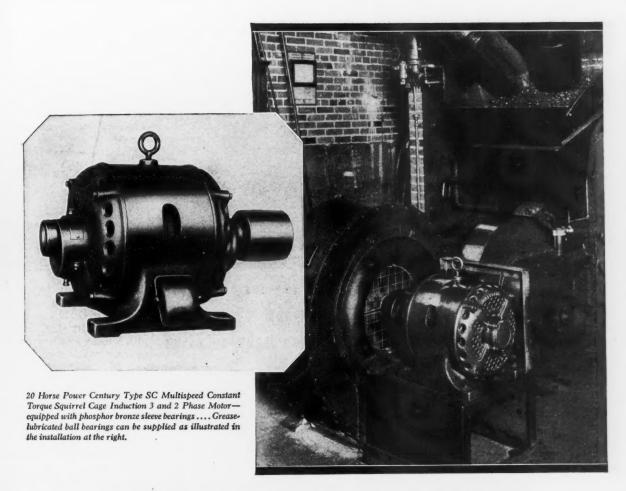
61-7732-6 244—MACHINERY, August, 1930 There is a right Wagner Motor for every job, because Wagner builds every commercial type of a. c. motor. Literature on Request

WAGNER ELECTRIC CORPORATION

6400 Plymouth Ave., St. Louis

Sales and Service in 25 Principal Cities

PRODUCTS FANS DESK WALL CEILING
TRANSFORMERS POWER DISTRIBUTION INSTRUMENT
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# **MULTISPEED MOTORS**

CONSTANT HORSE POWER
CONSTANT TORQUE . . . . . VARIABLE TORQUE

The operating economy of Century Type SC Multispeed Squirrel Cage Induction 3 and 2 Phase Motors is due to their power demand being in direct ratio to the horse power rating at a given speed . . . . This makes them particularly desirable in all installations where lower operating cost is a factor or where adjustable speed requirements must be met—as in blowers, fans, machine tools, wood-working machinery and similar apparatus.

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Built in standard sizes from 1/4 to 125 horse power, also in normal torque, high torque and normal or low starting current types.

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1806 PINE ST. . . ST. LOUIS, MO.

40 U.S. and Canadian Stock Points and More Than 75 Outside Thereof

SINGLE PHASE, THREE PHASE, AND DIRECT CURRENT MOTORS Century

MOTOR GENERA-TOR SETS, ROTARY CONVERTORS, FANS AND VENTILATORS

FOR MORE THAN 26 YEARS AT ST. LOUIS

When buying DIE CASTINGS consider the

# METHODS MATERIALS MACHINERY

employed by your supplier.

The Allied organization is headed by men experienced not only in die casting but also in the broader field of general manufacturing. They are prepared to give you an unbiased opinion on your production problems. They are equipped to tell you just how the Allied process can be applied to your product and what advantages and economies you can expect thru its use. They have the courage to tell you that the die casting process cannot be of assistance to you, when, in their opinion, such is the case.

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Phoenix Die Castings are cast accurate to specifications and require no finishing. They are made to the most intricate designs from a wide range of alloys compounded in our own plant. They are stronger, more accurate and more economical—standard with many manufacturers for years.

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Our experience at this work covers a 24-year period.

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Designers and Builders of Special Machinery

## FIFTY YEARS

Swaging and Drilling Equipment Contract Swaging from Pin Pointing to 5" Stock Machines and Parts Built on Contract

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we offer to make for you:

Tools that are time saving. Tools that are foolproof. Tools that are easy to manipulate. Tools that will give largest possible production. Tools that will give largest possible production. Tools that will give absolute interchangeability.

Send us your blueprints and specifications. We specialize in difficult toolwork such as the average toolroom has difficulty in handling. Will gladly furnish estimate and will make prompt delivery.

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Our equipment includes Pratt & Whitney Jig Borer, Die Shapers, Vertical, Internal and External Grinders, Lucas Boring Mills, Gray Planers, Die Filing Machines. Prompt Service. Try us.

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Scrap costs far more than its price per pound — hours of time, labor and costly machining are required to remove it. Save all this with Johnston & Jennings Forgings. They're made *closer to blue print dimensions*, "clean up" quickly and with minimum expenditure of time and effort.

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Send for free samples in the sizes you use most. Stock sizes for arbors of the following diameters:



%, ½, %, %, %, 1, 1%, 1¼, 1%, 1%, 1%, 1%, 1%, 1%, 1%, and 4 inches and larger.

Stock Thickness: .001, .002, .003, .004, .005, .006, .007, .008, .010, .012, .015, .020, .025, .032, .047, .068, .093, and .125 inch.

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Let us supply you with your hollowbored and turned forgings. Our larger capacity and superior equipment assure faster and more dependable service on orders of any size; our enormous production guarantees lower cost.

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OUR 36 years' experience in DIE-CASTING enables us to give you QUALITY and SERVICE. ALLOYS the very best used in all castings closely checked by our own METALLURGIST. Let our engineering department explain the savings possible in the use of die castings. We design and make our own DIES. QUOTATIONS made on parts NICKEL or CHROME plated. GOOD WILL reflects as an index to our large number of satisfied customers.

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Die Castings in Aluminum, Zinc, Tin and Lead Alloys If You Value Quick Action and Real Cooperation, Let us Quote.

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STYLE C
Hand Closing Die Head
for hand turret
machines.

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STYLE EE
(Rotary)
Designed for automatics,
threading machines and
bolt cutters; where the
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STYLE D
Head for Brown & Sharpe
Automatics and other
small machines.

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NOW!

Take advantage of the Eastern Machine Screw Co.'s offer to send you an H & G Die Head on approval for 30 days. Put it to work in your own shop, test it under your own conditions. Let it prove

to you that you can cut your threading cost by lining up with these superior H & G features.

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- ▲ Longer life chasers ▲ ▲
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We are making it possible for you to invest in a sure thing. Simply let us know size and type of machine and a description of the thread, and we will send you one on approval. Prove to your own satisfaction what profits H & G Die Heads will earn for your company before you spend a cent.

All products will win your approval by their simplified, constant, and efficient operation. Any of the many styles of die heads and threading machines are alike designed to increase earning capacity.

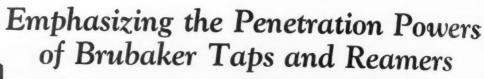
You will find many advantages of H & G Die Heads on any automatic screw machine, turret lathe, or threader. There are sizes and styles to cover all types and yet all styles of heads, of a given size, use the same chasers.

If you have not received your copy of the "Threaded Part Data Book," send for it today. You will find in it an indispensable source of information in connection with the design and manufacture of threaded parts. Just a line on your company letterhead will bring this "Book of the Year" to your desk promptly.

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Truman and Barclay Streets, New Haven, Conn.





F YOU have a lot of tapping or reaming work to do, you will get more holes per hour - without interruptions-if you use Brubaker tools. They penetrate smoothly, quickly, accurately, and with a minimum of breakage. Tool engineers and production managers prefer Brubaker small tools because they are economical and profitable and the prices are comparatively low. Send for catalog of Brubaker Tools.

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Spiral Fluted Stay Bolt Taps. Reamers. Dies. End Mills. Straight and Taper Inserted Blade Reamers.

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Lovejoy Face Milling Cutters have inserted cutters that take more regrinds and can be renewed at a fraction of the cost of a new tool. They are held rigid by the Lovejoy Positive Locking Principle, and can be set at varying angles for high or coarse feeds. Your heaviest cuts will be production jobs with Lovejoy Cutters. Get the details.

THE LOVEJOY TOOL CO., Inc. SPRINGFIELD, VERMONT METAL CUTTING TOOLS

For Economy in Precision Boring



Flynn Micrometer Off-Set **Boring Heads** 

A mechanically-perfect precision head of simple design and few parts.

Jaws and Jaw Screws are of nickel steel, heat treated and ground.

This compact head has the least overhang of any head on the market, yielding utmost rigidity, and maximum table travel.

Made in a full range of sizes to fit all standard spindles and arbors. Send for descriptive bulletin and price list.

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By a Quick, Easy, Inexpensive Method.

Literature on Request

Watts Bros. Tool Works WILMERDING, PA.



and Standard, Milling ters, Saws, Gear Cutters, Rotary Knives, Solid Type Reamers and Special Tools.



COWLES TOOL COMPANY, Cleveland, Ohio

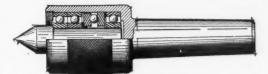


#### Here's a Real Production Aid?

An Alive Ball Bearing Center permits you to operate your machines at top speed without danger of sticking or burning. Hardened ground center point "turns with the work," never requires regrinding and does not enlarge center holes in soft metal work. Modern shops are using "Alive" Ball Bearing Centers—increasing production, lowering tool and grinding costs.

Write for price list.

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"They turn with the work"

66ALIVE?

**Ball Bearing Centers** 



THURSTON High Speed Steel DOUBLE END MILL

# A Fraction More Cost for Double Duty

When you travel you buy a round-trip ticket and save a good portion of a single trip fare. Why not apply the same principle to your milling equipment?

The Thurston High Speed Steel Double End Mill is "round trip equipment." It not only saves the user a large part of the cost of two tools, but saves time; quickly reversible, it speeds production by eliminating regrinds and trips to the tool crib. Positive drive, and a patented locking feature that prevents turning or pulling out of the chuck. Sizes from %" to 1¼", spiral and two-lip.

Write for Catalog "G."

#### THURSTON MANUFACTURING CO.

45 Borden St., Providence, R. I.



TWO-LIPPED END MILL





SINGLE END MILL



Reaming this taper pin hole took 20 minutes with an ordinary reamer—it takes 2 minutes now that the Gammons Taper Pin Reamer is used on the job.

Time one of these time and money saving tools on a like job in your plant.



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#### HIGH SPEED TWIST DRILLS

that will solve your drilling problems

"KA-2"

Black Devil Bakelite Oil Hole
Gun Concave Special Spiral
Special and Standard Types
for all purposes

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# TAPS AND REAMERS by REIFF & NESTOR

Manufacturers of high grade Taps and Reamers for Railroad, Industrial and Automotive fields.

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#### Modern Methods-Modern Machines —and these Modern Threading Tools

That's the combination that guarantees profitable threading! Murchey Collapsing Taps and Self-Opening Die Heads are simple, rugged, built to last—the logical choice for every production threading job. Select the right tools for your particular work from 59 sizes of Taps, 42 sizes of Die Heads.





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AGENTS: Cleveland, Production Tool Sales Co., 4500 Euclid Ave.; Chicago, R. E. Ellis Engineering Co., 621 Washington Blvd.; Haviland Wright, 3701 N. Broad St., Philadelphia, Pa.; J. Van Doren, 52 Vesey St., N. Y. C.; Kemp Machinery Co., 215 North Calvert St., Baltimore, Md.; Machinists Tool Supply Co., 414 E. 3rd Andless, Calif.; R. C. Neal Co., 76 Pearl St., Buffalo, N. Y., 46 Andrews St., Rochester, N. Y., 569 So. Clinton St., Syracuse, N. Y.; Coats Machiner Tool Co., 14 Palmer St., Westminster, London, S. W., England.

#### RED-LINE

Standard Production Tools in 15 Leading Automotive Plants



Expansion Reamer-Roughing Pilot





Expansion Reamer-King Bolt



High Speed Drill-New chip breaker drill with serrated teeth.

Special EXCLUSIVE features in design enable these tools, at low cost, to make outstanding production records in well-known plants. Send for details of special features and a price list-put your tooling equipment in the production efficiency class.

RED-LINE REAMER CO., Millersburg, Pa.

# Support here ... **Prevents Breakage** of Tool Bits



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#### ITS LISE

A good one for your driller, miller, shaper or planer.

The attachments mean that you can do much duplicate drilling without the cost of a jig.

Any vise will pay. More time is consumed in catching work than drilling it.



THE GRAHAM MFG. CO. PROVIDENCE, R. I.

# ILL VISE

THREE SIZES

No. 3, Jaws 6" long. No. 4, Jaws 9" long. No. 5, Jaws 12" long. V-Jaws, extra, for All.

With and without Jig Attachments



"OK" Solid Shank END MILL

This cutter is made of selected steels for both driving and cutting. The body is forged of alloy steel heat treated, while the blades are forged of high speed steel and incorporate the patented feature of O K serrated lock. Blades can be renewed when required or reground and set out for diameter if necessary. Made in all diameters and with special shanks to order. Standard sizes carried in stock. Send for circular 17.

"Our Service Department is

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Sole British Representatives: Richard Lloyd & Co., Birmingham, England.

LATHES, SHAPERS, PLANERS, BORING MILLS, AUTOMATICS, SPECIAL MACHINES, MILLING MACHINES



#### OSGOOD'S DIAMOND TOOLS AND FILE ACCESSORIES

HIGH GRADE DIAMOND TOOLS for all purposes. OSGOOD FILEGRIPS—rubber tips that protect hands. OSGOOD INDESTRUCT-IBLE FILE HANDLES can't split or come off.

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Standard of excellence for more than a hundred years. Write for our Catalog A

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GEAR TOOTH CHAMFERING MACHINES SPEED REDUCING GEARS-CLUTCHES SPECIAL MACHINERY

W. C. LIPE, Inc.

208 S. Geddes Street

Syracuse, N.Y.



rate holes at any speedthey never overheat or score the work. They are adjust-able to .00025" and incor-porate floating cutters to compensate for misalignments. Handle all work % and up, in any metal.

Madison Mfg. Co. MUSKEGON MICHIGAN

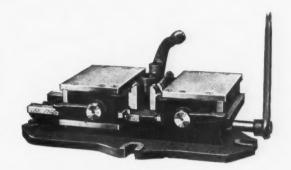
# Review VISES—for RIGIDITY



The Berjo Bench Vise enables the mechanic to set up any job, no matter how irregularly shaped, quickly and rigidly. It saves time on bench work, cuts costs on hand operations.

Send for details of Berjo Vises. Try one—a single installation will convince you that they are indispensable in your plant.

The Berjo Machine Vise (below) practically eliminates the need for jigs and fixtures on a wide range of operations on miller, shaper or drill press because it takes odd shaped as well as regular work and holds it *rigid* under heavy cuts.



#### THE AVEY DRILLING MACHINE CO., Inc., Cincinnati, O.

# The Pronto Quick Operating and Wide Opening Lever Vises

Designed for Milling and Drilling Machines and are specially adapted for any work where a large number of pieces are to be quickly handled. MADE IN THREE SIZES.



EDW. PURVIS & SON

110 YORK ST. Successors to Carter & Hakes BROOKLYN, N. Y.

#### The Vise for Production

The Gem Drill Vise eliminates the need for jigs and fixtures to hold odd-shaped work. Its swivel jaw is self-adjusting to work of any type, and greatly reduces setting-up time.

V-grooves in the jaws prevent slipping.

Three sizes, jaws opening to 10½". Catalogs and prices on request.



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precision files

ROR a better and more economical filing job, use this nationally-recognized precision file.

Over 30 years of experience in manufacturing files stands back of American Swiss products.

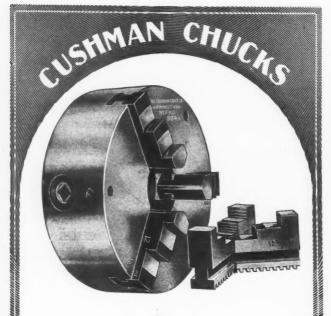
Write for File Handbook.

AMERICAN SWISS FILE & TOOL CO. 410-416 Trumbull St. Elizabeth, N. J.

2400 different sizes, shapes and cuts of American Swiss Files of Precision allow file users a wide range of selection from which to choose the right file for their work.

"Buy from your Distributor"

MACHINERY, August, 1930-255



#### The New 34A Line Self-Centering Chucks with the Geared Scroll Movement

The First Chucks of A. F. Cushman with their cast iron scrolls were very different from those we are making today, but they carried our name around the world, and eventually in other countries. a Geared Scroll Chuck (no matter who made it) was given a concrete name which would fit into any language -it was called a "Cushman."

Catalogue 47, if you will ask for it, can tell you a great deal about all kinds of Cushman Chucks, and some of it you probably have never known.



THE CUSHMAN CHUCK CO. HARTFORD, CONN.U.S.A.

# WESTCOTT CHUCKS

Lathe Chucks—Drill Chucks



Combinations-Independents-Universals Two-Jaw Round Body Lathe Chucks "Little Giant" Drill Chucks

> Send for Catalog on complete line

#### CASLER OFFSET **BORING HEADS**



Style "A"
Boring Head

Reduce the cost of Jigs **Fixtures Experimental Work** 

> Manufacturing Send for Catalog

WESTCOTT CHUCK COMPANY 116 E. Walnut St., Oneida, New York

Manufacturers of Lathe and Drill Chucks Sole Distributor for Casler Offset Boring Heads

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Improved design is everywhere in evidence in the Sweetland 4-Jaw Independent Lathe Chuck, Style No. 5. Balance and strength are ideally combined with minimum weight. Bearings are of hardened steel, screws are large and well made, and flush with the chuck body. Hardened steel jaws, and a reversible bearing surface, ground true, are other welcome features. Ask for Catalog 13C for full details of the Sweetland line.

The Hoggson & Pettis Mfg. Co. New Haven

#### ASK US!

when you're up against any unusual problem connected with the use of a magnetic chuck. We'll gladly investigate and report on it and, if you wish, design a special chuck for your particular need. And at surprisingly low cost! Write us for catalog.



J. & H. ELECTRIC CO., 200 Richmond Street PROVIDENCE, R. I.

# The Walker Goal

"The Story of the Walker Line"



No. 410 Toolroom Magnetic Chuck with Duplex Base.

GREATER efficiency, greater simplicity, with ever increasing range of application—that is our goal—that has been our goal ever since the first Walker Magnetic Chuck made its mark.

Walker Chucks today are admittedly "the best way to hold most work, the only way to hold some of it"—our goal is to make them the most practical way to hold any work regardless of size or shape. To this end Walker Engineers are constantly simplifying, developing, improving the ever growing line of standard chucks; bending their energies to the solution of special and difficult work holding problems.

Result—the Walker Line! The story of the Walker Chuck is a continued story we'd like to send you from time to time.

No., 822 all steel Rectangular Magnetic Chuck for Nos. 3 and 33 Abrasive Grinders.



No. 1436 all steel rectangular Magnetic Chuck. This type is built in sizes ranging from 8° x 24° up to 18° x 87° for Abrasive, Diamond, Pratt & Whitney, Bridgeport, Gallmeyer & Livingston and similar Surface Grinding Machines.

O. S. WALKER CO., Inc., Worcester, Mass.



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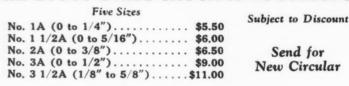


SENSITIVE

#### KEYLESS DRILL CHUCK

Slip a drill in by hand. Take it out the same way. No lost keys. No tightening a couple of times. No slip. No scored shanks. No fuss; just go ahead.

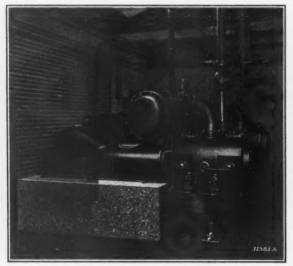
#### THE ETTCO DRILL CHUCK IS SUCCESSFUL



#### ETTCO TOOL COMPANY, Inc.

600 Johnson Ave., Brooklyn, New York

ETTCO DRILL CHUCKS



#### Machines that pay dividends

On the assembly line, air-operated tools speed the work. Here good air compressors, and good tools are profitable investments. The Ingersoll-Rand XRE Compressor shown

The Ingersoll-Rand XRE Compressor shown above, is more rugged, more compact, and more economical than ever before. It will help earn more dividends. There is a size for every need.

every need.

Ingersoll-Rand Compressors and Air Tools are helping make profits on many of the most highly organized and efficient assembly lines in the world.



# Fine BOKER Steels and Tools

#### KEYLESS Drill Chuck

- 1. Hand Operated.
- 2. Ball Bearing action.
- 3. Perfectly balanced and concentric in operation.
- 4. Drills cannot slip.



Try one for 30 days.

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#### TAPPING CHUCKS

Simplest Reverse-Gear; Add Style of Tap-Holder required:—Positive, Friction, Quick-Change or Multiple Head; without complication of Funda-

mental Structure. Most highly Specialized for each job, yet most widely adaptable for future requirements.

Our High Speed Tappers are Super-Sensitive for Small tapping.



Graduated

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder, if required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.



Sockethead Cap and Hollow Set **SCREWS** 

"UNBRAKO" Screws are fa-mous for their unusually accu-rate and clean threads. The O" won't fracture, won't round in n't mushroom. "UNBRAKO"

A complete line always in stock. Write us for free samples and Form 398.

Standard Pressed Steel Co.



Jenkintown, Pa.

The "PROCUNIER" Friction Tapper

can be used on any old drill press for your toughest tapping job, blind or through. We guarantee perfectly tapped holes too! The low prices we ask will astound you; write for 15-day free trial offer, and complete catalogue.

PROCUNIER SAFETY CHUCK CO., 20 S. Clinton St., Chicago, Ill.



STRONG CARLISLE HAMMOND MAC-IT Hollow Safe-ty Set and Cap Screws. 1396 W. 3rd St., Cleveland, O.





MACHINERY, August, 1930-259

# On Buffalo Oil Well Drilling Units BRISTO SAFETY SET SCREWS

I T is not surprising that Bristo Safety Set Screws are a part of the Standard equipment of Buffalo Oil Well Drilling Units.

Stoppage of operations to tighten up or replace a set screw is not in the cards in the oil fields.

BRISTOS, with patented dovetailed socket, which gives the wrench a perfect grip on the screw, set up solid and stay set until released.

And abnormal pressure, in place of splitting or flaring the socket, tends only to contract it. Instantly responsive to the wrench, BRISTOS can be set quicker and tighter than ordinary set screws.

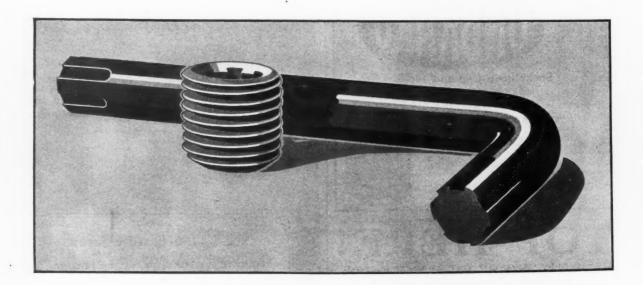
This means a saving of time in assembling, and also assures a greater measure of service to your customers.

Bristo Safety Set Screws improve the ap-



One of a series of business magazine advertisements now running on Buffalo units.

pearance of your product, increase its efficiency, and cost you no more than ordinary set screws. We will be glad to send you samples. Write Dept. E.



# BRISTO SAFETY SET SCREWS

THE BRISTOL COMPANY, WATERBURY, CONN.

# For that Special assembly job







# we'll provide the right Self-tapping Screw

THE great majority of people wear readymade clothes. The rest have theirs made to measure—to suit individual tastes or figures.

The same with our various types of Selftapping Screws. Each type is made in a wide range of standard sizes for general use but if a special size or style of head is needed for your application, we can furnish a screw exactly to the specifications the job requires. A few standard and special Selftapping Screws are illustrated here.



Type "A"—Hardened Sheet Metal Screw (below)

For joining sheet metal and making fastenings to sheet metal up to 14 gauge. Turn the Screw into a drilled or punched hole—taps its own thread.



Type "Z" — Hardened
Sheet Metal Screw
(above)
For making fastenings
to sheet metal up to 10
gauge: and to aluminum and die castings,
slate, ebony asbestos,
etc. Used same as the
Type "A" Screw.



Hardened Metallic Drive

For making permanent fastenings to iron, brass and aluminum castings, steel, Bakelite, etc. Just hammer the Screw into a drilled or formed hole—taps its own thread.

If you will send us details of your assembly problem, our engineering department will study it carefully and make recommendations as to the type and size of screw best suited for your purpose. We will also submit suitable samples for test. This service is at your disposal free of cost or obligation.

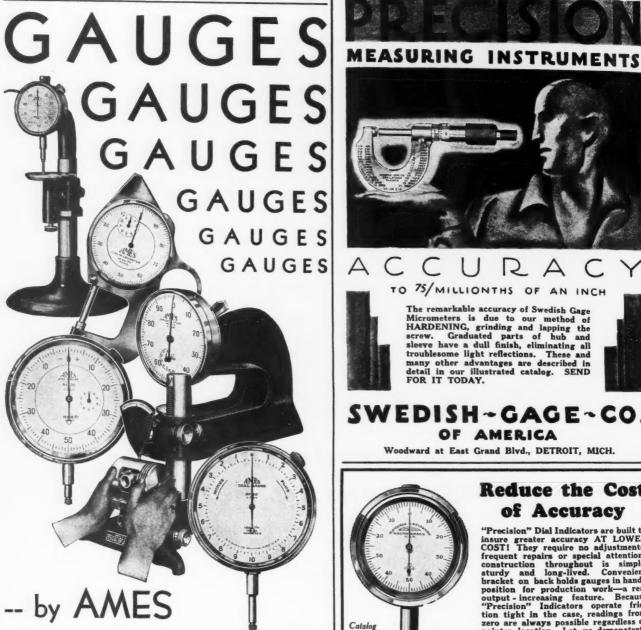
Hundreds of manufacturers try these unique Screws first for their assemblies. They have found that no other means is so easy, speedy and economical. It will certainly pay you to do likewise.

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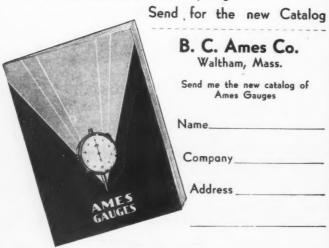
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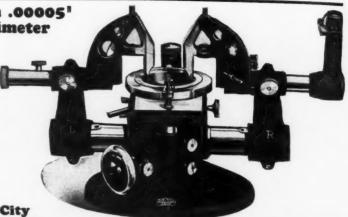
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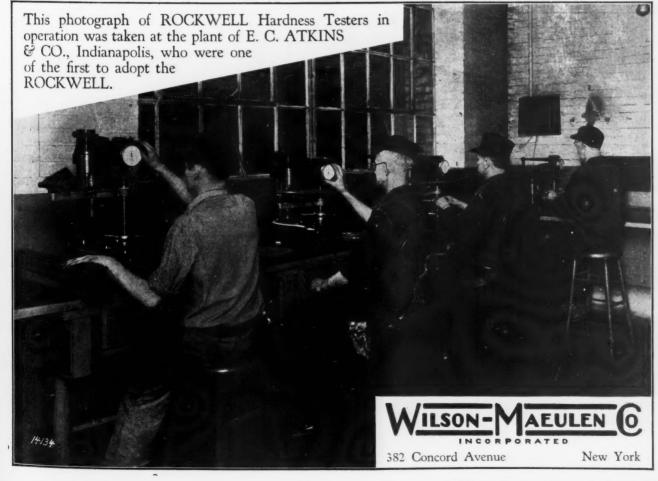
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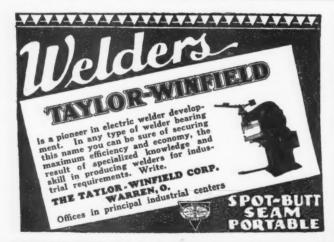
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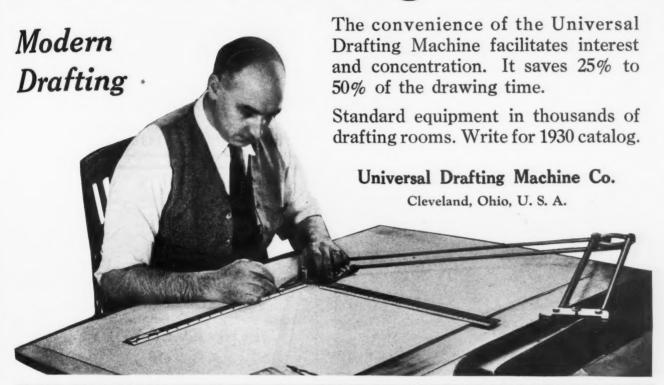
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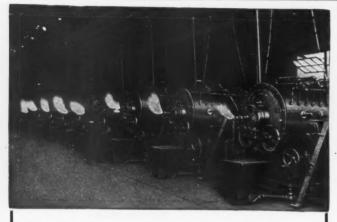
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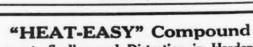
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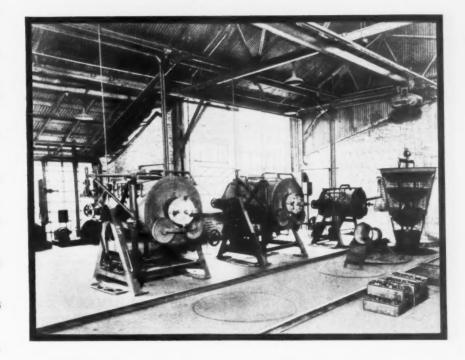
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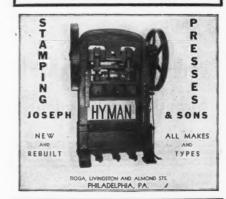
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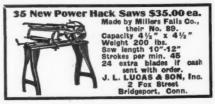
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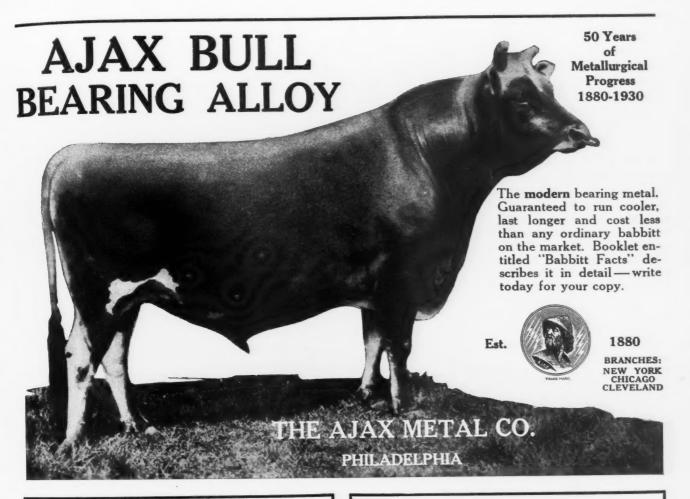
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and Pump	28" G&E Invincible B.G.
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1 plain spindle 800	No. 3 Bliss-Con. O.B.I. 2100 lbs. 350
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surf. gdr. No. 3—8x24" 600 26" Ransom Disc 2 tables 350	
1 No. 1 /2 Cincin, cutter and tool 450	Hammer, No. 5A High Speed
12x12x48 Springfield Brandes Surface Magnetic Chuck &	Riveter
No. 11 B.&S. plain 6"x32" 400	
No. 2 Norton "D" Foundry, 24" wheels 156	for spur gears 450
LATHES	Driven Power 100
12"x7' Simplex, geared head, Q.C.G., SPD, w. reg. equipt. 400	Oil Separator, 2 bu. Ourtis,
13"x5' South Bend, std. change	28" 3-jaw Whiton Steel Body
wors with c/s and reg, equipt 200	y Combination onuck 120

SCOTT-BANSBACH MACHINERY CO.

130 S. CLINTON ST.

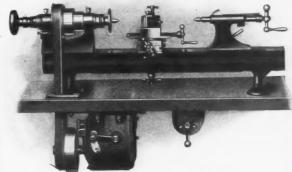
CHICAGO, ILLINOIS



# Precision Bench Lathes and Millers

Short Cuts or Efficiency?

Both the carpenter who hammers his wood screws and the machinist who uses a heavy Lathe or Miller for a small job have mistaken ideas of a short cut.



No. 4 Stark Lathe with Motor Drive Unit

A proper job in the shortest time requires the right tools. STARK Lathes and Millers fill this need on small work and are far faster and more accurate than heavier machines. May we give you further details?

# STARK TOOL COMPANY, Waltham, Mass.

Established 1862. Originators of the American Bench Lathe

# MACHINERY'S PRODUCT INDEX

# FOR LOCATION OF ADVERTISEMENTS OF MANUFACTURERS LISTED IN THIS INDEX SEE ALPHABETICAL INDEX, PAGES 297-298

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ACCUMULATORS. HYDRAULIC Elmes Engineering Wks., Chas. F., 222 N. Morgan St., Chicago, French Oil Mill Mchry. Co., Piqua, O. Watson-Stillman Co., 73 West St., N. Y.

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AIR TOOLS

See Grinders, Pneumatic; Drills, Portable Pneumatic, etc.

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BARS, BORING See Boring Bars.

BARS, PHOSPHOR BRONZE Buckeye Brass & Mfg. Co., Cleveland. Bunting Brass & Bronze Co., Toledo, O.

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Ryerson, Joseph T., & Son, 2558 W.
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Mass.

ALPHABETICAL INDEX OF ADVERTISERS, PAGES 297-298



Model CC Twin Disc Duplex Clutch

# START.

# AND TWO SPEEDS AT THE TOUCH OF A FINGER . . .

Here's a machine that forms angles, channels, mouldings, tubing, etc., from flat metal at a speed of 125 to 200 feet per minute... the Type 1-B Roller Die Forming Machine built by The McKinney Tool and Mfg. Co., Cleveland, Ohio.

Such production speed demands perfect control. McKinney engineers built it in . . . with the new "CC" Twin Disc duplex action clutch, which is standard equipment on this machine.

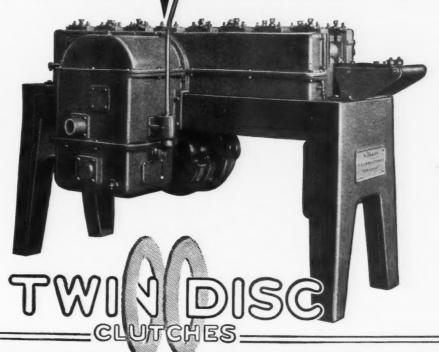
Remarkably compact . . . with unusually large capacity for size the "CC" Twin Disc clutch

.STOP..

engages and releases smoothly, without objectionable dragging. The hub
contains all the operating mechanism
... centrifugal force operates to release
pressure levers. Oil spray gives all lubrication necessary. The few adjustments
necessary are easily made.

Machine designers appreciate the greater adaptability of the "CC" Twin Disc clutch. It is purposely designed to meet conditions of engineering modern, high capacity machine tools. Sizes: 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7 and 9 inches effective diameters; single or duplex, oil or dry plate, types. Write for Engineering data book or consult our Engineering Research Dept. for specific recommendations. Twin Disc Clutch Company, Racine, Wis.

Back View of
Type I-B Roller
Die Forming Machine..
Twin Disc Clutches
built in gear box.



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McCrosky Tool Corp., Meadville, Pa.
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Westcott Chuck Co., Oneida, N. Y.
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Whitman & Whitman & Whi

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CHUCKS, LATHE, ETC.

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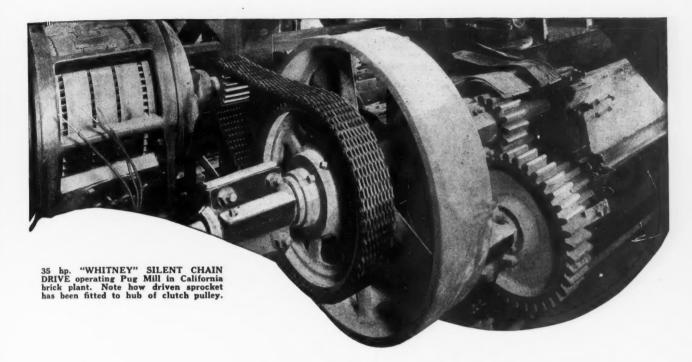
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Ames Co., B. C., Waltham, Mass. Avey Drilling Mch. Co., Cincinnati, Barnes, W. F. & John, Co., Rockford, Buffalo Forge Co., Buffalo, N. Y.
Burke Mch. Tool Co., 516 Sandusky St.,
Conneaut, O.
Canedy-Otto Mfg. Co., Chicago Heights,
Ill. Ill.
Cincinati Electrical Tool Co., Cincinati, Ohio.
Dumore Co., 25 16th St., Racine, Wis.
Elgin Tool Works, Inc., Elgin, Ill.
High Speed Hammer Co., Inc., Rochester,
N. Y. N. Y. Kingsbury Mch. Tool Corp., Keene, N. H. Langelier Mfg. Co., Providence, R. I. LeBlond, R. K., Mch. Tool Co., Cin-LeBlond, R. K., Mch. Tool Co., Un-cinnati. Leland-Gifford Co., Worcester, Mass. Millholland Sales & Engineering Co., Indianapolis, Ind. National Auto. Tool Co., Richmond, Ind. Rockford Drilling Mch. Co., Rockford, III Ill.
Sigourney Tool Co., 11 Sigourney St.,
Hartford. Conn.
Simmons, W. H., & Co., Cincinnati.
Standard Electrical Tool Co., 1936 W.
8th St., Cincinnati.
Superior Mch. Tool Co., Kokomo, Ind.
U. S. Electrical Tool Co., Cincinnati.

# DRILLING MACHINES, BOILER

Cincinnati-Bickford Tool Co., Oakley, Cincinnati, Foote-Burt Co., Cleveland, O. Sellers, Wm., & Co., Inc., Philadelphia.

### DRILLING MACHINES, GANG

Avey Drilling Mch. Co., Cincinnati, Baker Bros., Inc., Toledo, O. Barnes Drill Co., 814 Chestnut St., Rockford, Ill. Barnes, W. F. & John, Co., Rockford, Ill Barnes, Ill. Bradford Mch. Tool Co., Cincinnati. Canedy-Otto Mfg. Co., Chicago Heights, Ill. III.
Cincinnati-Bickford Tool Corp.,
Cincinnati.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Rochester, R. Rochester Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Foote-Burt Co., Cleveland, O. Hoefer Mfg. Co., Freeport, Ill. Ingersoll Milling Mch. Co., Rockford, Ill. Kingsbury Mch. Tool Corp., Keene, N. H. Langelier Mfg. Co., Providence, R. I. Leland-Gifford Co., Worcester, Mass. Millholland Sales & Engineering Co., Indianapolis, Ind. Moline Tool Co., Moline, Ill. Cesterlein Mch. Co., Cincinnati. Rockford Drilling Mch. Co., Rockford, Ill. Ill.
Sigourney Tool Co., 11 Sigourney St.,
Hartford, Conn.
Superior Mch. Tool Co., Kokomo, Ind.

# DRILLING MACHINES, HORIZON-TAL DUPLEX

Avey Drilling Mch. Co., Cincinnati.
Barnes, W. F. & John, Co., Rockford,
Bradford Mch. Tool Co., Cincinnati.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Frew Machine Co., Philadelphia.
Kingsbury Mch. Tool Corp., Keene, N. H.
Langelier Mfg. Co., Providence, R. I.
Milholland Sales & Engineering Co.,
Indianapolis, Ind.
Murchey Mch. & Tool Co., 951 Porter
St., Detroit.
Rockford Drilling Mch. Co., Rockford,
Ill. Avey Drilling Mch. Co., Cincinnati. Barnes, W. F. & John, Co., Rockfo

# DRILLING MACHINES, MULTIPLE SPINDLE

Avey Drilling Mch. Co., Cincinnati.
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St.,
Rockford, Ill.
Barnes, W. F. & John, Co., Rockford, ROCKIUM,
Barnes, W. F. & John,
III.
Bradford Mch. Tool Co., Cincinnati,
Canedy-Otto Mfg. Co., Chicago Heights,
III. Till
Cincinnati-Bickford Tool Co., Oakley,
Cincinnati.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Foots-Burt Co., Cleveland, O.
Greenlee Bros. & Co., Rockford, Ill.
Hoefer Mfg. Co., Freeport, Ill.

Ingersoll Milling Mch. Co., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Langelier Mfg. Co., Povidence, R. I.
Leland-Gifford Co., Worcester, Mass.
Manning, Maxwell & Moore, Inc., 100
E. 42nd St., New York.
Millholland Sales & Engineering Co.,
Indianapolis, Ind.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmend, Ind.
Pratt & Whitney Co., Hartford, Conn.
Rockford Drilling Mch. Co., Rockford,
Ill.

Rockford Drining and III.
Sellers, Wm., & Co., Inc., Philadelphia, Simmons, W. H., & Co., Cincinnati. Superior Mch. Tool Co., Kokomo, Ind. United States Drill Head Co., 1948 W. 6th St., Cincinnati.

# DRILLING MACHINES, MULTIPLE SPINDLE, TURRET

Kingsbury Mch. Tool Corp., Keene, N. H.

### DRILLING MACHINES, RADIAL

American Tool Works Co., Cincinnati. Barnes, W. F. & John, Co., Rockford, Ill. Canedy-Otto Mfg. Co., Cincinnati.
Till
Carlton Mch. Tool Co., Cincinnati.
Cincinnati-Bickford Tool Co., Oakley, dy-Otto Mfg. Co., Chicago Heights, Cincinnati-Bickford Tool Co., Oakley,
Cincinnati,
Giddings & Lewis Mch. Tool Co., Fond
du Lac, Wis.
Morris Mch. Tool Co., Cincinnati.
Niles Tool Works Co., Hamilton, O.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Sellers, Wm., & Co., Inc., Philadelphia
Western Mch. Tool Wks., Holland, Mich.

### DRILLING MACHINES, RAIL

Baker Bros., Inc., Toledo, O.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Defiance Machine Co., Defiance, O.
Foote-Burt Co., Cleveland, O.,
General Electric Co., Schenectady, N. Y.
Moline Tool Co., Moline, Ill.
Sellers, Wm., & Co., Inc., Philadelphia.

### DRILLING MACHINES, SENSITIVE

Avey Drilling Mch. Co., Cincinnati. Barnes, W. F. & John, Co., Rockford, Ill. III.

Burke Mch. Tool Co., 516 Sandusky St.,
Conneaut, O.
Canedy-Otto Mfg. Co., Chicago Heights,
III. Fil.
Foote-Burt Co., Cleveland, O.
Moline Tool Co., Moline, Ill.
High Speed Hammer Co., Inc., Rochester,
N. Y. N. Y.
Langelier Mfg. Co., Providence, R. L.
Leiman Bros., 152 Christie St., Newark, N. J.
Leland-Gifford Co., Worcester, Mass.
Manufacturers Consulting Engineers,
Syracuse, N. Y.
Pratt & Whitney Co., Hartford, Conn.
Rockford Drilling Mch. Co., Rockford,
Ill. TII Ill.
Royersford Fdry. & Mch. Co., Box M,
Royersford, Pa.
Sibley Mch. Co., 8 Tutt St., South Bend,
Ind. Ind.
Sigourney Tool Co., 11 Sigourney St.,
Hartford, Conn.,
Simmons, W. H., & Co., Cincinnati.
United States Mch. Tool Co., 1950 W.
6th St., Cincinnati.

# DRILLING MACHINES, UPRIGHT

Avey Drilling Mch. Co., Cincinnati. Baker Bros., Inc., Toledo, O. Barnes, W. F. & John, Co., Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Canedy-Otto Mfg. Co., Chicago Heights,
Ill. Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Cincinnati-Bickford Tool Co., Oakley, Chicinnati.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y., Froote-But Co., Cleveland, O. Harrington Co., Philadelphia, Pa. Hoefer Mfg. Co., Freeport, Ill. Ingersoll Milling Mch. Co., Rockford, Ill. Kingsbury Mch. Tool Corp., Keene, N. H. Langelier Mfg. Co., Providence, R. I. Leland-Gifford Co., Worcester, Mass. Millholland Sales & Engineering Co., Indianapolis, Ind.
Minster Machine Co., Minster, O. Moline Tool Corp., Moline, Ill. Oesterlein Mch. Co., Cincinnati. Rockford Drilling Mch. Co., Rockford, Simmons, W. H., & Co., Cincinnati. Superior Mch. Tool Co., Kokomo, Ind.

# DRILLING MACHINES, WALL

Canedy-Otto Mfg. Co., Chicago Heights, Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Hanna Engineering Wks., 1763 Elston Ave., Chicago. Wickes Bros., Saginaw, Mich.

DRILLS, CENTER
Cleveland Twist Drill Co., Cleveland.
Cogsdill Mfg. Co., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield,
Mass.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland, O.
Whitman & Barnes, Inc., Detroit, Mich.

Eclipse Counterbore Co., Detroit, Mich. Morse Twist Drill & Mch. Co., New Bedford, Mass.

### DRILLS, PORTABLE ELECTRIC

Black & Decker Mfg. Co., Towson, Md. Cincinnati Electrical Tool Co., Cincinnati, Ohio.

Dumore Co., 25 16th St., Racine, Wis. Errington Mechanical Laboratory, 200 Broadway, New York.

Hakins, R. G., Co., 4634 Fulton St., Chicago. Haskins, R. G., Co., 2003.
Chicago.
Hiser-Wolf Machine Co., Cincinnati,
Standard Electrical Tool Co., 1936 W.
8th St., Cincinnati,
U. S. Electrical Tool Co., Cincinnati,
White, S. S., Dental Mfg. Co., 150 W.
42nd St., New York.

# DRILLS, PORTABLE PNEUMATIC Ingersoll-Rand Co., 11 Broadway, N. Y.

### DRILLS, RATCHET

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Cleveland Twist Drill Co., Cleveland.
Greene, Tweed & Co., 109 Duane St.,
New York.
Greenfield Tap & Die Corp., Greenfield,
Mass. Mass.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Whitman & Barnes, Inc., Detroit, Mich.

# DRILLS, SOUARE AND HEXAGON

DRILLS, TWIST
Cleveland Twist Drill Co., Cleveland.
Colton, Arthur, Co., 2618 Jefferson
Ave., E., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Ave., E., Detrois, Manager and Ave., E., Detrois, Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn. Red-Line Reamer Co., Millersburg, Pa. Standard Tool Co., Cleveland, O. Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, Inc., Detroit, Mich.

### DRILLS, WIRE

Cogsdill Mfg. Co., Detroit, Mich

### DRIVE SCREWS

Parker-Kalon Corp., 200 Varick St., New York.

### DRYING MACHINES, METAL PARTS Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.

# ELECTRICAL SUPPLIES

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### ELEVATORS

Barrett-Cravens Co., 3269 W. 30th St., Chicago. Link Belt Co., Chicago, Ill.

# EMERY WHEELS

See Grinding Wheels

### EMERY WHEEL DRESSERS See Dressers, Grinding Wheel

ENGINEERS, CONSULTING MECHANICAL

Manufacturers Consulting Engineers, Syracuse, N. Y. ENGRAVING MACHINES

Gorton Machine Co., Geo., Racine, Wis. Preis, H. P., & Co., Inc., 538 South 10th St., Newark, N. J.

### ETCHING APPARATUS, ELECTRIC uma Electric Equipment Co., Toledo.

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Nicholson, W. H., & Co., 112 Oregon
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Watson-Stillman Co., 73 West St., N. Y.

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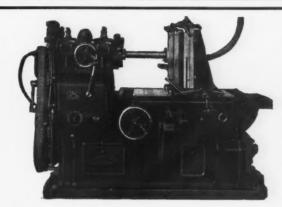


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V & O Press Co., Hudson, N. Y.

FERRO ALLOYS

New Jersey Zinc Co., 160 Front St.,
New York.
Vanadium Alloys Steel Co., Latrobe, Pa.

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FILE AND TOOL HANDLES
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Rockford Meh. Tool Co., 2400 Kishwaukee Rd., Rockford, Ill.
Sellers, Wm., & Co., Inc., Philadelphia.
Sibley Mch. Co., 8 Tutt St., South Bend,
Ind Ind.
Sigourney Tool Co., 11 Sigourney St.,
Hartford, Conn.
United States Mch. Tool Co., 1950 W.
6th St., Cincinnati.

### FILES

American Swiss File & Tool Co., Elizabeth, N. J.
Grobet File Corp. of America, 3 Park Place, New York.

### FILES, ROTARY

Keller Mechanical Engineering Co., 74 Washington St., Brooklyn, N. Y. Strand, N. A., & Co., 5001 N. Lincoln St., Chicago.

### FILING MACHINES, DIE, ETC.

Ames Co., B. C. Waltham, Mass. Haskins, R. G., Co., 4634 Fulton St., Chicago.

Chicago.

Wks., 2501 N. Keeler

Ave., Chicago.

Oliver Instrument Co., 1410 E. Maumee
St., Adrian, Mich.

Tolhurst Machine Wks., 645 N. Fulton St., Troy, N. Y.

### FITTINGS, HYDRAULIC

Metalwood Mfg. Co., Detroit, Mich. Watson-Stillman Co., 73 West St., New York.

FITTINGS, STEAM
Dart, E. M., Mfg. Co., Providence, R. I.

### FLEXIBLE SHAFT EQUIPMENT

Chicago Flexible Shaft Co., 1154 S. Central Ave., Chicago. Errington Mechanical Laboratory, 200 Broadway, N. Y. Haskins, R. G., Co., 4634 Fulton St., Haskins, R. G., Co., 4634 Fulton St., Chicago.
Keller Mechanical Engineering Corp., 74 Washington St., Brooklyn, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Strand, N. A., & Co., 5001 N. Lincoln St., Chicago.
White, S. S., Dental Mfg. Co., 150 W.
42nd St., New York.

American Gas Furnace Co., Elizabeth, N. J. Buffalo Forge Co., Buffalo, N. Y. Canedy-Otto Mfg. Co., Chicago Heights, Ill.

## FORGING MACHINES

Acme Machinery Co., Cleveland, O.
Ajax Mfg. Co., Cleveland, O.
Bliss, E. W., Co., Brooklyn, N. Y.
National Machinery Co., Tiffin, O.
Waterbury Farrel Fdry. & Mch. Co.,
Waterbury, Com.

### FORGINGS, UPSET

Johnston & Jennings Co., Addison Rd. & Lake Shore R.R. Tracks, Cleve-land, O. Williams, J. H., & Co., Buffalo, N. Y.

### FORGINGS, IRON AND STEEL

American Hollow Boring Co., Erie, Pa. Dyson & Sons, Joseph. Cleveland. Johnston & Jennings ('o., Addison Rd. & Lake Shore R.R. Tracks, Cleveland

FORMING & BENDING MACHINES Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Niagara Mch. & Tool Wks., Buffalo.

Adams Co., Dubuque, Ia. Ingersoll-Rand Co., 11 Broadway, N. Y. Link Belt Co., Chicago, Ill. New Britain-Gridley Mch. Co., New Britain, Conn.

# FURNACES, HEAT-TREATING

ELECTRIC
General Electric Co., Schenectady, N. Y
Hevi Duty Electric Co., Milwankee, Wis
Hoskins Mfg. Co., Detroit. Mich.
Leeds & Northrup Co., Philadelphia.
Strong, Carlisle & Hammond Co.,
Cleveland, O.

# FURNACES, HEAT TREATING OIL, GAS, ETC.

American Gas Furnace Co., Elizabeth, N. J. N. J. Brown & Sharpe Mfg. Co., Providence. Chicago Flexible Shaft Co., 1154 S. Central Ave., Chicago. Strong Carlisle & Hammond Co., Cleveland, O.

### FURNITURE, DRAFTING-ROOM

Hamilton Mfg. Co., Two Rivers, Wis. New Britain-Gridley Mch. Co., New Britain, Conn. Pease, C. F., Co., 822 No. Franklin St., Chicago, Ill.

### FURNITURE, SHOP

Angle Steel Stool Co., Plainwell, Mich. Hamilton Mfg. Co., Two Rivers, Wis. New Britain-Gridley Mch. Co., New Britain, Conn.

### GAGE STANDARDS

Pratt & Whitney Co., Hartford, Conn. Van Keuren Co., Watertown, Mass. Zernickow, O., Co., 21 Park Row, N. Y.

### GAGES, COMPARATOR

Federal Products Corp., Providence. Jones & Lamson Mch. Co., Springfield, Vt. rr, Geo., Co., 144 Liberty St., N. Y.

### GAGES, DEPTH

Brown & Sharpe Mfg. Co., Providence, Slocomb Co., J. T., Providence, R. I. Starrett, L. S., Co., Athol, Mass. Taylor-Shantz Co., Rochester, N. Y.

### GAGES. DIAL

GAGES, DIAL

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Brown & Sharpe Mfg. Co., Providence.
Federal Products Corp., Providence.
Lowe, H. A., Clereland, O.
Scherr, Geo., Co., 144 Liberty St., N. Y.
Starrett, L. S., Co., Athol, Mass.
Taylor-Shantz Co., Rochester, N. Y.

### GAGES. HEIGHT

Brown & Sharpe Mfg. Co., Providence. Starrett, L. S., Co., Athol, Mass.

### GAGES, PLUG AND RING

Brown & Sharpe Mfg. Co., Providence. Ferner, R. Y., Co., Washington, D. C. Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Kokomo, Ind.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., Watertown, Mass.

# GAGES, RECORDING, STEAM

Bristol Co., Waterbury, Conn.

Brown & Sharpe Mfg. Co., Providence Cleveland Twist Drill Co., Cleveland. Ferner, R. Y., Co., Washington, D. C. Greenfield Tap & Die Corp., Greenfield, Mass Greenfield Tap & Die Corp., GroomMass.
Pratt & Whitney Co., Hartford, Conn.
Starrett, L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor-Shantz Co., Rochester, N. Y.
Van Keuren Co., Watertown. Mass.
Williams, J. H., & Co., Buffalo, N. Y.

GAGES, SURFACE
Brown & Sharpe Mig. Co., Providence.
Columbus Die Tool & Machine Co.,
Columbus, O.,
Columbus, O.,
Athol, Mass.
Taylor-Shants Co., Rochester, N. Y.

### GAGES, TAPER

Pratt & Whitney Co., Hartford, Conn. Starrett, L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

### GAGES. THREAD

Bath, John & Co., Inc., Worcester, Mass. Mass.

Brown & Sharpe Mfg. Co., Providence.
Federal Products Corp., Providence.
Ferner, R. Y., Co., Washington, D. C.
Greenfield Tap & Die Corp., Greenfield,
Mass.
Hanson-Whitney Mch. Co., Hartford. Ct.
Jones & Lamson Mch. Co., Springfield,
Vt.
Vt. Whitney Co. Vt.
Pratt & Whitney Co., Hartford, Conn.
Starrett, L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Greene, Tweed & Co., 109 Duane St., New York.

### GEAR BLANKS, BRONZE

Williams, J. H., & Co., Buffalo, N. Y.

# GEAR BLANKS, NON-METALLIC

Braun Gear Corp., 1323 Gates Ave., Brooklyn, N. Y. Chicago Rawhide Mfg. Co., 1302 Elston Ave., Chicago. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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# GEAR CUTTING MACHINES, HELICAL AND SPUR (HOB)

Adams Co., Dubuque, Ia.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence.
Gould & Eberhardt, Newark, N. J.
Meisselbach-Catucci Mfg. Co., Newark, N. J. Newark Gear Cutting Mch. Co., Newark, N. J. Zernickow, O., Co., 21 Park Row, N. Y.

# GEAR CUTTING MACHINES, HELICAL AND SPUR (SHAPER OR PLANER TYPE)

Fellows Gear Shaper Co., Springfield. National Tool Co., Cleveland, O.

# GEAR CUTTING MACHINES, SPIRAL BEVEL Gleason Works, Rochester, N. Y.

## GEAR CUTTING MACHINES, SPIRAL PINION ROUGHER Gleason Works, Rochester, N. Y

GEAR CUTTING MACHINES, WORMS AND WORM WHEELS (HOB) Adams Co., Dubuque, Ia.
Barber-Colman Co., Rockford, III.
Gould & Eberhardt, Newark, N. J.
Meisselbach-Catucci, Mfg. Co., Newark,
N. J.
Newark Gear Cutting Mch. Co., Newark,
N. J. N. J. Scherr, Geo., Co., 144 Liberty St., New York. Zernickow, O., Co., 21 Park Row, N. Y.

# GEAR HARDENING MACHINES

Gleason Works, Rochester, N. Y.

### GEAR TESTING MACHINERY

GEAR TESTING MACHINERY
Adams Co.. Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence.
Davenport Mch. Tool Co., Inc., Rochester, N. Y.,
Ferner, R. Y., Co., Washington, D. C.
Gleason Works. Rochester, N. Y.
Illinois Tool Wks., 2501 N. Keeler
Ave., Chicago.
Manufacturers Consulting Engineers,
Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
National Tool Co., Cleveland.
Scherr, Geo., Co., 144 Liberty St.,
New York.

### GEAR TOOTH SPECIALISTS

Hammar Co., Inc., 16 State St., New York.

### GEARS, CUT

GEARS, CUT

Adams Co., Dubuque, Ia.
American Die & Tool Co., 205 Buttonwood St., Reading, Pa.
Bilgram Machine Wis., 1231 Spring
Garden St., Philadelphia.
Bond. Chas., Co., Philadelphia, Pa.
Boston Gear Works Sales Co., North
Quincy, Mass.
Braun Gear Corp., 1323 Gates Ave.,
Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence.
Chicago Rawhide Mfg. Co., 1302 Elston
Ave., Chicago.
Chicago. Co., Cincinnati.
Crofoot, Chas. E., Gear Corp., 65 Central St., South Easton, Mass.
Cullman Wheel Co., 1339 Altgeld St.,
Chicago, Ill.

# Davis, Rodney, Philadelphia. Diefendorf Gear Corp., Syracuse, N. Y. Earle Gear & Mol. Co., 4709 Stenton Ave., Philadelphia. Ave., Philadelphia, Falk Corp., Milwaukee, Wis. Fellows Gear Shaper Co., Springfield, Vt.

Fellows Gear Shaper Co., Springfield, Vt.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 37,
111 N. Canal St., Chicago,
General Electric Co., Schenectady, N. Y.
Grant Gear Works, Inc., Boston, Mass.
Harrington Co., Philadelphia, Pa.
Hartford Special Mchy. Co., Hartford
Hein-Werner Motor Parts Corp., Waukesha, Wis.
Hindley Gear Co., 504 N. 19th St.
Philadelphia.
Horsburgh & Scott Co., Cleveland.
Johnson, Carlyle, Machine Co., Manchester, Conn.
Link Belt Co., Chicago, Ill.
Massachusetts Gear & Tool Co., 34
Nashua St., Woburn, Mass.
Meisel Press Mfg. Co., 948 Dorchester
Ave., Boston 25, Mass.
Meissel Press Mfg. Co., Newark.
N. J.
Newark Gear Cutting Mch. Co., Newark

Newark Gear Cutting Mch. Co., Newark, Newark Gear Cutting Mch. Co., Newark, N. J.
Philadelphia Gear Works, Philadelphia, Pittsburgh Gear & Mch. Co., 2700
Smallman St., Pittsburgh, Pa.
Poole Engineering & Machine Co., Baltimore, Md.
Scherr, Geo., Co., 144 Liberty St., New York.
Simonds Mfg. Co., Pittsburgh, Pa.
Smith, Winfield H., Inc., 116 Eaton St., Springville, N. Y.
Stahl Gear & Mch. Co., Cleveland.
Toledo Mch. & Tool Co., Toledo, O.
Westinghouse Electric & Mfg. Co., East
Pittsburgh, Pa.

### GEARS, FORGED

Braun Gear Corp., 1323 Gates Ave., Brooklyn, N. Y.

### GEARS, MOLDED

Foote Bros. Gear & Mch. Co., Dept. 37, 111 N. Canal St., Chicago. Franklin Die Casting Corp., Syracuse, N. Y. N. Y. Horsburgh & Scott Co., Cleveland. Link Belt Co., Chicago, Ill. Philadelphia Gear Works, Philadelphia Poole Engineering & Machine Co., Baltimore, Md. Simonds Mfg. Co., Pittsburgh, Pa. Stahl Gear & Mch. Co., Cleveland. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

# GEARS, RAWHIDE AND

NON-METALLIC

Boston Gear Works Sales Co., North Quincy, Mass.
Fraun Gear Corp., 1323 Gates Ave., Brooklyn, N. Y.
Chicago Rawhide Mfg. Co., 1302 Elston Ave., Chicago.
Gear Corp., Syracuse, N. Y.
Earle Gear & Mch. Co., 4709 Stenton Ave., Philadelphia.
Federal Gear, Inc., Cleveland, O.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 37,
111 N. Canal St. Chicago.
General Electric Co., Schenectdy, N. Y.
Grant Gear Works, Inc., Boston, Mass.
Hartford Special Mely. C. Hartford.
Horsburgh & Scott Co., Develand.
Massachusetts Gear T. Mass.
Meisel Press Mig. Co., 48 Dorchester
Ave., Boston 25, Mass.
Newark Gear Cutting Mch. Co., Newark,
N. J.
Philadelphia Gear Works, Philadelphia,
Pa.
Pitsburgh Gear & Mch. Co., 2700 Pa.

Pa.

Pittsburgh Gear & Mch. Co., 2700

Smallman St., Pittsburgh, Pa.

Simonds Mfg. Co., Pittsburgh, Pa.

Smith, Winfield H. Inc., 116 Eaton

St., Springville, N. Y.

Stahl Gear & Mch. Co., Cleveland.

Westinghouse Electric & Mfg. Co., East

Pittsburgh, Pa.

## GENERATORS, ELECTRIC

General Electric Co., Schenectady, N. Y. Lincoln Electric Co., Cleveland, O. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

# GENERATORS, GAS

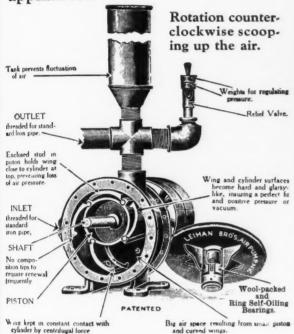
American Gas & Furnace Co., Eliza-beth, N. J.

### GLUE HEATERS

Divine Bros. Co., Inc., 100 Whitesboro St., Utica, N. Y. General Electric Co., Schenectady, N. Y.

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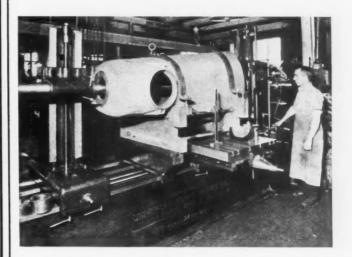
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# (Horizontal) BORING MACHINE Tri-Way Type



Unusual shapes can be bored, drilled and milled with one set-up on a Universal (Horizontal) Boring Machine: save time, save labor.

The work on the table is a tumbling barrel for a paint mixing machine.

Length of line bore 6'; dia. of bore 8". Accuracy held to plus or minus .001". Dia. of hole on front of barrel, 12". Operation is facing outside dia. of bore, 13½" and boring 12" dia. Accuracy held to plus or minus .005". Time to complete job, 5 hours; material, cast iron.

The "Universal" shown in the shop above pays for itself every year.

Accurate, fast, adaptable to a large variety of work, Universal (Horizontal) Boring Machines have proved a profitable investment for many shops. Write for descriptive Bulletins.

# UNIVERSAL BORING MACHINE CO.

HUDSON, MASS., U. S. A.

"WHERE ACCURACY COUNTS, WE WIN."

MACHINERY, August, 1930-281

GRADUATING MACHINES

Perner, R. Y., Co., Washington, D. C.
Gorton Mch. Co., Racine, Wis.
Noble & Westbrook Mfg. Co., Hartford,
Conn.

Preis, H. P., & Co., Inc., 538 South
10th St., Newark, N. J.

### GREASE

Sun Oil Co., Philadelphia.

### GREASE CUPS

Bowen Products Corp., Auburn, N. Y. Link Belt Co., Chicago, Ill.

### GRINDERS, PNEUMATIC

Independent Pneumatic Tool Co., 606 W. Jackson Blvd., Chicago. Ingersoll-Rand Co., 11 Brosdway, N. Y. Madison-Kipp Corp., Madison, Wis.

# GRINDERS, PORTABLE ELECTRIC

GRINDERS, PORTABLE ELECTRIC
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Dunore Co., 25 16th St., Racine, Wis.
Hisey-Wolf Machine Co., Cincinnati.
Independent Pneumafic Tool Co., 606
W. Jackson Biyd., Chicago.
U. S. Electrical Tool Co., Cincinnati.
White, S. S. Dental Mfg. Co., 150 W.
42nd St., New York.

# GRINDING ATTACHMENTS, WORM Newark Gear Cutting Mch. Co., Newark, N. J.

# GRINDING MACHINES, ABRASIVE

Porter-Cable Mch. Co., Salina & Wolf Sts., Syracuse, N. Y. Production Mch. Co., Greenfield, Mass, Walls Sales Corp., 96 Warren St., N. Y.

### GRINDING MACHINES, BENCH

Black & Decker Mfg. Co., Towson, Md. Blount, J. G., Co., Central Ave., Everett, Mass. Blount, J. G., Co., Central Ave., Everett, Mass.

Mass.

Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct. Cincinnati. Electrical Tool Co., Cincinnati, Ohio.

Gallmeyer & Livingston Co., 344 Straight Ave., S. W., Grand Rapids, Mich. Hammond Mchry. Builders, Inc., 1604 Douglas Ave., Kalamazoo, Mich. Hardinge Bros., Inc., 4149 Ravenswood Ave., Chicago.

Hisc.-Wolf Mch. Co., Cincinnati, Ohio. New Britain, Com.

Production Equipment Co., Cleveland. Rivett Lathe & Grinder Corp., Brighton, Boston, Mass.

Ryerson, Joseph T., & Son, 2558 W. 16th St., Chicago.

Standard Electrical Tool Co., 1986 W. Sth St., Cincinnati.

Sterling Grinding Wheel Co., Tifin, O. U. S. Electrical Tool Co., Cincinnati. Walker, O. S., Co., Inc., Worcester, Mass.

# GRINDING MACHINES, CENTER

Cincinnati Electrical Tool Co., Cincinnati, Ohio.
U. S. Electrical Tool Co., Cincinnati. Electrical Tool Co., Cincin-

# GRINDING MACHINES, CENTER-LESS

Cincinnati Grinders Inc., Cincinnati.

# GRINDING MACHINES, CHASER

Arter Grinding Mch. Co., Worcester, Mass.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Geometric Tool Co., New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.
Vational Machinery Co., Tiffin, O.

GRINDING MACHINES, CHUCKING Arter Grinding Mch. Co., Worcester, Mass. Bryant Chucking Grinder Co., Spring-field, Vt.

# GRINDING MACHINES, CUTTER See Grinding Machines, Tool & Cutter.

GRINDING MACHINES, CYLINDER Heald Machine Co., Worcester, Mass

GRINDING MACHINES, CYLIN-DRICAL, PLAIN Arter Grinding Mch. Co., Worcester, Mass. Mass.
Brown & Sharpe Mfg. Co., Providence,
Cincinnati Grinders Inc., Cincinnati.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Fitchburg Grinding Mch. Corp., Fitchburg, Mass.
Greenfield Tap & Die Corp., Greenfield,
Mass. Mass.
I.andis Tool Co., Waynesboro, Pa.
Modern Tool Works (Consolidated Mch.
Tool Corp.) Rochester, N. Y.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.

# GRINDING MACHINES, CYLIN-DRICAL, UNIVERSAL

Brown & Sharpe Mfg. Co., Providence, Cincinnati Grinders Inc., Cincinnati, Consolidated Mch. Tool Corp. of America, Rochester, N. X.

# Fitchburg Grinding Meh. Corp., Fitch- GRINDING MACHINES, PISTON RING

burg, Mass.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Thompson Grinder Co., Springfield, O.

# GRINDING MACHINES, DIE SINK-ERS'-PORTABLE

Hisey-Wolf Mch. Co., Cincinnati, Ohio Keller Mechanical Engineering Corp. 74 Washington St., Brooklyn, N. Y White, S. S., Dental Mfg. Co., 150 W 42nd St., New York.

### GRINDING MACHINES, DISC

GRINDING MACHINES, DISC
Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct.
Gallmeyer & Livingston Co., 344 Straight
Are., Grand Rapids, Mich.,
Gardner Mch. Co., 414 E. Gardner St.,
Beloit, Wis.
Hammond Mchry. Builders, Inc., 1604
Douglas Ave., Kalamazoo, Mich.
Porter-Cable Mch. Co., Salina & Wolf
Sts., Syracuse, N. Y.
Production Equipment Co., Cleveland.
Rowbottom Mch. Co., Waterbury, Conn.
U. S. Electrical Tool Co., Cincinnati.

### GRINDING MACHINES, DRILL

GRINDING MACHINES, DRILL
Bridgeport Safety Emery Wheel Co., Inc.,
1283 W. Broad St., Bridgeport, Ct.
Gallmeyer & Livingston Co., 344 Straight
Ave., Grand Rapids, Mich.
Hammond Mchry. Builders, Iac., 1804
Douglas Ave., Kalamasco, Mich.
LaSaile Tool Co., Ottawas, Ill.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Oliver Instrument Co., 1410 E. Maumee
St., Adrian, Mich.
Sellers, Wm., & Co., Inc., Philadelphia.
Union Twist Drill Co., Athol, Mass.

# GRINDING MACHINES, FLOOR STAND TYPE

Black & Decker Mfg. Co., Towson, Md. Blount, J. G., Co., Central Ave., Everett, Mass. idgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct. ncinnati Electrical Tool Co., Cincin-Bridgeport Safety Emery Bridgeport, Ct.
1283 W. Broad St., Bridgeport, Ct.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Stone Co., Cleveland.
Gallmeyer & Livingston Co., 344 Straight
Ave., Grand Baprids, Mich.
Hammond Mchry, Builders, Inc., 1604
Hisey-Wolf Mch. Co., Cincinnati, Ohio.
Douglas Ave., Kalamazoo, Mich.
Production Equipment Co., Cleveland.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Standard Electrical Tool Co., 1936 W.
Sth St., Cincinnati.
Sterling Grinding Wheel Co., Tiffin, O.
U. S. Electrical Tool Co., Cincinnati.

# GRINDING MACHINES, GAGE Ferner, R. Y., Co., Washington, D. C. Scherr, Geo., Co., 144 Liberty St., N. Y.

# GRINDING MACHINES, GEAR

National Tool Co., Cleveland.

### GRINDING MACHINES, HOB

Barber-Colman Co., Rockford, Ill.
Pfauter, Herman, Works, 21 Park Row,
New York.
Scherr, Geo., Co., 144 Liberty St., N. Y.
Union Twist Drill Co., Athol. Mass.
Zernickow, O., Co., 21 Park Row, N. Y.

# GRINDING MACHINES, INTERNAL Bryant Chucking Grinder Co., Spring-field, Vt.

field, Vt.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Giddings & Lewis Mch. Tool Co., Fond
du Lac, Wis.
Greenfield Tap & Die Corp., Greenfield. du Lac, Wis.

Greenfield Tap & Die Corp., Greensender Mass.
Heald Machine Co., Worcester, Mass.
Heald Machine Co., Waynesboro, Pa.
Micro Machine Co., Bettendorf, Iowa.
Modern Tool Works (Consolidated Mch.
Tool Corp.) Rochester, N. Y.
Rivett Lathe & Grinder Corp., Brighton,
Boston, Mass.
Van Norman Mch. Tool Co., Springfield,
Mass.

# GRINDING MACHINES, KNIFE

Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct.

# GRINDING MACHINES, MULTIPLE

Bryant Chucking Grinder Co., Spring

# GRINDING MACHINES, PATTERN MAKERS, DISC Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

GRINDING MACHINES, PIPE

# THREADING DIE Bignall & Keeler Mch. Wks., Edwardsville, Ill. Landis Mch. Co., Inc., Waynesboro, Pa. National Machinery Co., Timn, O. Production Equipment Co., Cleveland.

Arter Grinding Mch. Co., Worcester, Mass. Heald Machine Co., Worcester, Mass. Pedrick Tool & Mch. Co., 3639 N. Lawrence St., Philadelphia.

## GRINDING MACHINES, PORTABLE ELECTRIC & TOOLPOST See under Grinders, Portable Electric.

GRINDING MACHINES, PULLEY Graham Mfg. Co., Providence, R. I.

# GRINDING MACHINES, RADIAL

Van Norman Mch. Tool Co., Springfield,

# GRINDING MACHINES, RING

WHEEL
Bridgeport Safety Emery Wheel Co., Inc.,
1283 W. Broad St., Bridgeport, Ct.
Gardner Mch. Co., 414 E. Gardner St.,
Beloit, Wis.
Graham Mfg. Co., Providence, R. I.

# GRINDING MACHINES, SURFACE Abrasive Mch. Tool Co., East Providence, R. I. Arter Grinding Mch. Co., Worcester,

Mass.
Blanchard Mch. Co., 64 State St.,
Cambridge, Mass.
Bridgeport Safety Emery Wheel Co., Inc.,
1283 W. Broad St., Bridgeport, Ct.
Brown & Sharpe Mfg. Co., Providence.
Consolidated Meh. Tool Corp. of America,
Rochester, N. Y.

Consolidated Meh. Tool Corp. of America, Rochester, N. Y.
Fitchburg Grinding Mch. Corp., Fitchburg, Mass.
Gallmeyer & Livingston Co., 344 Straight Ave., Grand Rapids, Mich.
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., Worcester, Mass.
LaSalle Tool Co., Ottawa, Ill.
Norton Co., Worcester, Mass.
Fratt & Whitney Co., Hartford, Conn.
Froduction Equipment Co., Cleveland.
Rowbottom Mch. Co., Waterbury, Conn.
U. S. Electrical Tool Co., Cincinnat.,
Walker, O. S., Co., Inc., Worcester, Mass.

### GRINDING MACHINES, SWING

Black & Decker Mfg. Co., Towson, Md. Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct. Cleveland Stone Co., Cleveland, O. Gallmeyer & Livingston Co., 344 Straight Ave., Grand Rapids, Mich. Production Equipment Co., Cleveland. Sterling Grinding Wheel Co., Tiffin, O.

### GRINDING MACHINES, TAP

Arter Grinding Mch. Co., Worcester, Mass. Ferner, R. Y., Co., Washington, D. C. Gallmeyer & Livingston Co., 344 Straight Ave., Grand Rapids, Mich.

# GRINDING MACHINES, TOOL AND

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Arter Grinding Mch. Co., Worcester,
Mass.
Baird Mch. Co., Bridgeport, Conn.
Barber-Colman Co., Rockford, Ill.
Blount, J. G., Co., Central Ave., Everett,
Mass.
Bridgeport Safatz Evener When Co.

Blount, J. G., Co., Central Ave., Everett, Mass.
Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct. Brown & Sharpe Mig., Co., Providence. Cincinnati Electrical Tool Co., Cincinnati, Ohlo.
Cincinnati Grinders Inc., Cincinnati.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Dumore Co., 25 16th St., Racine, Wis. Fafrir Bearing Co., New Britain, Conn., Fitchburg Grinding Mch. Corp., Fitchburg, Grand Espids, Mich.
Ave., Grand Espids, Mich.
Ave., Grand Espids, Mich.
Gorton Machine Co., Geo., Racine, Wis.
Gorton Machine Co., Geo., Racine, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.

Gould & Eberhaute,
Greenfield Tap & Die Corp., Greenfield,
Mass.
Ingersoll Milling Mch. Co., Rockford, Ill.
LeBlond, R. K., Mch. Tool Co., Cin-

Ingersoil Milling Mch. Co., Rockford, Ill.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Meisselbach-Catucei Mfg. Co., Newark.
Modern Tool Works (Consolidated Mch.
Tool Corp.) Rochester, N. Y.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
Newark Gear Cutting Mch. Co., Newark,
N. Tool. Co., Worcester, Mass.
Octorlo M. M. Co., Cincinnati.
Oliver Instrument Co., 1410 E. Maumee
St., Advian, Mich.
Pratt & Whitney Co., Hartford, Conn.
Production Equipment Co., Cicreiand.
Royersford G. & Co., Inc., Philadelphia
Eleira, With Co., Mass.
Union Twist Drill Co., Athol. Mass.
U. S. Electrical Tool Co., Cincinnati.
Union Twist Drill Co., Athol. Mass.
U. S. Electrical Tool Co., Cincinnati.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Mch. Wks., Waltham, Mass.

# GRINDING MACHINES, UNIVERSAL Fitchburg Grinding Meh. Corp., Fitch-burg, Mass. Gallmeyer & Livingston Co., 344 Straight-Ave., Grand Rapids, Mich. Greenfield Tap & Die Corp., Greenfield, Mass.

Ave., Grand
Greenfield Tap & Die Corp., Grand
Mass.
LeBiond, R. K., Mch. Cool Co., Cincinnati.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Thompson Grinder Co., Springfield, O.

# GRINDING MACHINES, UNIVERSAL LATHE AND PLANER TOOL Gisholt Machine Co., Maidson, Wia. Sellers, Wm., & Co., Inc., Philadelphia,

GRINDING WHEELS
Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Ct. Carborundum Co., Niagara Falls, N. Y. Cleveland Stone Co., Cleveland, O. Norton Co., Worcester, Mass.
Sterling Grinding Wheel Co., Tiffin, O. Vitrified Wheel Co., Westfield, Mass.

GUARDS FOR MACHINERY
Chicago Perforating Co., 2245 W. 24thPlace, Chicago.
New Britain, Gridley Mch. Co., New
Britain, Conn.
Taylor-Shantz Co., Rochester, N. Y.
Wiesman Mfg. Co., Dayton, O.

# GUARDS FOR PUNCH PRESSES, SAFETY

Taylor-Shantz Co., Rochester, N. Y. Wiesman Mfg. Co., Dayton, O.

HAMMERS, DROP
Chambersburg Engineering Co., Chambersburg, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Niles Tool Works Co., Hamilton, O.
Toledo Mch. & Tool Co., Toledo, O.

# HAMMERS, FORGING AIR Nazel Engineering Co. & Mch. Wks., 4043 N. 5th St., Philadelphia.

AMMERS, HELVE igh Speed Hammer Co., Inc., Rochester.

HAMMERS, POWER
High Speed Hammer Co., Inc., Rochester,
Nazel Engineering Co. & Mch. Wks.,
4043 N. 5th St., Philadelphia.

HAMMERS, SOFT Chicago Rawhide Mfg. Co., 1302 Elston-Ave., Chicago.

# HAMMERS, STEAM

Chambersburg Engineering Co., Chambersburg, Pa.
Niles Tool Works Co., Hamilton, O.
Sellers, Wm., & Co., Inc., Philadelphia

### ANGERS, BOX

Shafer Bearing Corp., 6501-99 W. Grand Ave., Chicago.

HANGERS, SHAFT
American Pulley Co., Philadelphia, Pa.
Brown & Sharpe Mig. Co., Providence.
Fafnir Bearing Co., New Britain, Conn
Foote Bros. Gear & Mch. Co., Dept. 37.
111 N. Canal St., Chicago,
Link Belt Co., Chicago, Ill.
Royersford Fdfy. & Mch. Co., Box M.
Royersford Fdfy. & Mch. Co., Box M.
Royersford, Pa.
Sellers, Wm., & Co., Inc., Philadelphia
S. K. F. Industries, Inc., 40 E. 34th
St., New York.
Smith, Winfield H., Inc., 116 Eaton St.,
Springville, N. Y.
Standard Pressed Steel Co., Jenkintown,
Pa.
Wood's, T. B., & Sons Co., Chambersburg, Pa.

# HARDNESS TESTING INSTRU-MENTS

Shore Instrument & Mfg. Co., Jamaica, N. Y. Wilson-Maeulen Co., Inc., 382 Concord Ave., New York.

# HARDNESS TESTING MACHINERY Olsen, Tinius, Testing Machine Co., Philadelphia.

American Metal Treatment Co., Elizabeth, N. J.
Bantam Ball Bearing Co., South Bend, Ind.
Bennett Treating Co., Elmwood, Coun.
Pittsburgh Gear & Mch. Co., 2700
Smallman St., Pittsburgh, Pa.,
Williams, White & Co., Moline, Ill.

HOBBING MACHINES
See Gear Cutting Machines, Helical and Spur (Hob) and Gear Cutting Machines, Worm and Worm Wheel (Hob).

# HOBS

Barber-Colman Co., Rockford, Ill. Brown & Sharpe Mfg. Co., Providence Colonial Broach Co., Detroit.



Shuster Wire Straightening and Cutting Off Machines are the pioneer products of their field. Models for round stock are made in several sizes, for wire as small as .020" and as large as 3/4" diameter. We will gladly estimate their savings on any specification, and send Catalogue.

THE F. B. SHUSTER CO. New Haven, Conn.

Straightener Specialists Since 1866

because of low upkeep and steady performance"

-Marlboro Wire Goods Co.

This progressive manufacturer of household appliances uses a quantity of wire that requires nine Straightening and Cutting-Off Machinesall Shusters-to handle. They are of various sizes, for 3/8" wire, and smaller, and have standard equipment with this user for the past ten years.

The machine shown in the foreground is a single belt driven type of 1/8" size, operating on this diameter of wire, and cutting it into lengths of 28". These lengths are used in the manufacture of dish drainers, soap dishes, broilers, etc., and it turns out a tremendous production every day.

In addition to the statement we have quoted in the headline, this Shuster user further states that the workmanship and durability of the Shuster equipment is outstanding.

# SHUSTER WIRE STRAIGHTENING & CUTTING-OFF MACHINES

MACHINERY, August, 1930-283

Gould & Eberhardt, Newark, N. J. Greenfield Tap & Die Corp., Greenfield, Greenfield Tap & Die Corp., Greenfield, Mass. Illinois Tool Wks., 2501 N. Keeler Ave., Chicago. chisselbach-Catucci Mfg. Co., Newark, N. J.
Michigan Tool Co., Detroit, Mich.
Newark Gear Cutting Mch. Co., Newark,
N. J.
Union Twist Drill Co., Athol, Mass.

# HOISTING AND CONVEYING

Link Belt Co., Chicago, Ill. Shepard Niles Crane & Hoist Corp., 380 Schuyler Ave., Montour Falls, N. Y.

Hanna Engineering Wks., 1763 Elston Ave., Chicago. Ingersoil-Rand Co., 11 Broadway, N. Y.

# HOISTS, CHAIN, ETC.

Chisholm-Moore Hoist Corp., 5038 Fre-mont Ave., Tonawanda, N. Y. Harrington Co., Philadelphia, Pa. Roeper Crane & Hoist Wks., Reading. Pa.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Sprague Elec. Hoists, Div. of Shepard
Elec. Crane & Hoist Co., 30 Church
St., New York.

### HOISTS, ELECTRIC

American Engineering Co., Philadelphia Chisholm-Moore Hoist Corp., 5038 Fre-mont Ave., Tonawanda. N. Y. Roeper Crang & Hoist Wks., Reading, Pa. Shepard Niles Crane & Hoist Corp., 380 Schuyler Ave., Montour Falls, N. Y.

### HOISTS, PORTABLE

Canton Fdry. & Mch. Co., Canton, O. Ingersoll-Rand Co., 11 Broadway, N. Y.

HONING MACHINES, CYLINDER
Barnes Drill Co., 814 Chestnut St.,
Rockford, Ill.
Ingersoll Milling Mch. Co., Rockford, Ill.
Moline Tool Corp., Moline, Ill.

# OSE AND HOSE COUPLINGS, PNEUMATIC TOOL

Ingersoll-Rand Co., 11 Broadway, N. Y.

# HYDRAULIC MACHINERY AND

TOOLS

American Engineering Co., Philadelphia. Chambersburg Engineering Co., Chambersburg, Pa.

Elmes Engineering Wks., Chas. F., 222 N. Morgan St., Chicago.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Wks.) 11 Broadway, N. Y. Metalwood Mfg. Co., Detroit, Mich. Niles Tool Works Co., Hamilton, O. Oligear Co., 660 Park St., Milwaukee, Wis.

Watson-Stillman Co., 73 West St., N. Y.

See also Milling Machines, Horizontal, Universal. Abrasive Mch. Tool Co., East Provi-dence, R. I. Brown & Sharpe Mfg. Co., Providence, Knight, W. B., Mchry. Co., St. Louis. Western Mch. Tool Wks., Holland, Mich.

### INDICATORS, SPEED

INDICATORS, SPEED
Brown & Sharpe Mfg. Co., Providence.
Greene, Tweed & Co., 109 Duane St.,
New York.
Scherr, Geo., Co., 144 Liberty St., N. Y.
Starrett, L. S., Co., Athol, Mass,
Veeder-Root, Inc., Hartford, Conn.
Zernickow, O., Co., 21 Park Row, N. Y.

# INDICATORS, TEST

INDICATORS, TEST
Brown & Sharpe Mfg. Co., Providence.
Federal Products Co., Providence.
Ferner, R. Y., Co., Washington, D. C.
Ideal Tool Co., Rochester, N. Y.
Lowe, H. A., Cleveland, O.
Norton Co., Worcester, Mass.
Randall, Frank E., Waltham, Mass.
Scherr, Geo., Co., 144 Liberty St., N. Y.
Starrett, L. S., Co., Athol, Mass.

### INTENSIFIERS, HYDRAULIC

Elmes Engineering Wks., Chas. F., 222 N. Morgan St., Chicago. Watson-Stillman Co., 73 West St., N. Y.

### JACKS, HYDRAULIC

Watson-Stillman Co., 73 West St., N. Y.

### JACKS, PLANER

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.

JIGS AND FIXTURES

American Die & Tool Co., 205 Buttonwood St., Reading, Pa.

American Tool & Mfg. Co., Urbana, O.

Brown & Sharpe Mfg. Co., Providence.
City Mch. & Tool Wks., Dayton, O.

Columbus Die, Tool & Mch. Co., Columbus Die, Tool & Mch. Co., Columbus, O.

Gisholt Machine Co., Madison, Wis.

Hartford Special Mchy. Co., Hartford.
Ingersoll Milling Mch. Co., Rockford, Ill.
Logansport, Ind.

Manufacturers Consulting Engineers,
Syracuse, N. Y.

Moline Tool Corp., Moline, Ill.

Pratt & Whitney Co., Hartford, Conn.

Precision Engineering Co., Philadelphia.

Ruthman Mch. Co., Cincinnati, O.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

Taylor-Shantz Co., Rochester, N. Y.

Tomkins-Johnson Co., Jackson, Mich.

### KEYSEATERS

Baker Bros., Inc., Toledo, O. Consolidated Mch. Tool Corp. of America. Rochester, N. Y. Davis Keyseater Co., Rochester, N. Y. Mitts & Merrill, 843 Water St., Saginaw, Wich

### KEYS, MACHINE

Smith & Serrell, Newark, N. J. Whitney Mfg. Co., Hartford, Conn. Williams, J. H., & Co., Buffalo, N. Y.

### KNIVES, ROTARY

Cowles Tool Co., Cleveland, Ohio,

### KNURL HOLDERS

Graham Mfg. Co., Providence, R. I. Pratt & Whitney Co., Hartford, Conn

### KNURLING TOOLS

American Swiss File & Tool Co., Elizabeth, N. J.
Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Pratt & Whitney Co., Hartford, Conn.
Williams, J. H., & Co., Buffalo, N. Y.

### LAMPS GUARDS, ETC.

McCrosky Tool Corp., Meadville, Pa.

### LATHE ATTACHMENTS

American Tool Works Co., Cincinnati,
Barnes Drill Co., 814 Chestnut St.,
Rockford, II.,
Bradford Machine Tool Co., Cincinnati,
Cincinnati, Lathe & Tool Co., Oakley,
Cincinnati, O.,
Isther Co., Nashua, N. H.
Hendey Machine Co., Torrington, Conn.
LeBlond, R. K., Mch. Tool Co., Cincinnati,
Lodge & Shipley Mch. Tool Co., Cincinnati,
Manning, Maxwell & Moore Version cinnati Maxwell & Moore, Inc., 100 E. 42nd St., New York. McCrosky Tool Corp., Meadville, Pa. Moline Tool Corp., Moline, Ill. Monarch Machine Tool Co., Sidney, O. Reed-Prentice Corporation, Worcester, Mass. Mass.
Rivett Lathe & Grinder Corp., Brighton,
Boston, Mass.
Sebastian Lathe Co., Cincinnati.
Seneca Falls Mch. Co., Seneca Falls,
N. Y.
South Bend Lathe Wks., South Bend, Ind.
Springfield Mch. Tool Co., 631 Southern
Ave.. Springfield, O.
Stark Tool Co., Waltham, Mass.
Sundstrand Mch. Tool Co., Rockford, Ill.

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago, Ready Tool Co., Bridgeport, Conn. Williams, J. H., & Co., Buffalo, N. Y.

### LATHES, AUTOMATIC

Gisholt Machine Co., Madison, Wis. Jones & Lamson Mch. Co., Springfield, LeBlond, R. K., Mch. Tool Co., Cin-LeBiond, R. A., succionaria.
National Acme Co., Cleveland.
New Britain-Gridley Mch. Co., New Britain, Conn.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Pratt & Whitney Co., Hartford, Conn. Reed-Prentice Corp., Worcester, Mass.
Rockford Machine Tool Co., 2412 Kishwaukee Road, Rockford, Ill.

# LATHES, AUTOMATIC SCREW THREADING

Automatic Mch. Co., Bridgeport, Conn.

### LATHES, AXLE AND SHAFT

Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Niles Tool Works Co., Hamilton, O. Sellers, Wm., & Co., Inc., Philadelphia. Seneca Falls Mch. Co., Seneca Falls, N. Y.

### ATHES, BENCH

LATHES, BENCH
Ames Co., B. C., Waltham, Mass.
Elgin Tool Works, Inc., Elgin, Ill.
Hardinge Bros., Inc., 4149 Ravenswood
Ave., Chicago,
Hjorth Lathe & Tool Co., Boston, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Corp., Brighton,
Boston, Mass.
Seneca Falls Mch. Co., Seneca Falls,
N. Y.
South Bend Lathe Wks., South Bend,
Ind. Stark Tool Co., Waltham, Mass. Van Norman Mch. Tool Co., Springfield, Mass.

### LATHES, BORING

Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Gisholt Machine Co., Madison, Wis. LeBlond, R. K., Mch. Tool Co., Cincinnati.

Niles Tool Works Co., Hamilton, O.

### LATHES, BRASS WORKERS'

LATHES, BRASS WORKERS'
Acme Machine Tool Co., Cincinnati.
Bardons & Oliver, Cleveland.
Seneca Falls Mch. Co., Seneca Falls,
N. Y.
Springfield Mch. Tool Co., 631 Southern
Ave., Springfield, O.
Warner & Swasey Co., Cleveland.

Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Niles Tool Works Co., Hamilton, O. Sellers, Wm., & Co., Inc., Philadelphia

### LATHES, CRANKSHAFT

LATHES, CRANKSHAFT

American Tool Works Co., Cincinnati.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Lodge & Shipley Mch. Tool Co., Cincinnati.
Niles Tool Works Co., Hamilton, O.
Wickes Bros., Saginaw, Mich.

### LATHES, DOUBLE-END

Greenlee Bros. & Co., Rockford, Ill. Sundstrand Mch. Tool Co., Rockford, Ill.

### LATHES, ENGINE

Acme Machine Tool Co., Cincinnati. American Tool Works Co., Cincinnati. Barnes Drill Co., 814 Chestnut St., Rockford, Ill. Boye & Emmes Mch. Tool Co., Cin-American Tool Works Co., Cincinnati. Barnes Drill Co., 814 Chestnut St., Rockford, Ill. Boye & Emmes Mch. Tool Co., Cincinnati. Fradford Machine Tool Co., Cincinnati. Cincinnati Lathe & Tool Co., Oakley, Cincinnati. Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Flather Co., Nashua, N. H. Gisholt Machine Co., Madison, Wis. Hardinge Bros., Inc., 4149 Ravenswood Ave., Chicago. Hendey Machine Co., Torrington, Conn. LeBlond, R. K., Mch. Tool Co., Cincinnati. Chimann Mch. Co., St. Louis, Mo. Lodge & Shipley Mch. Tool Co., Cincinnati. Manning, Maxwell & Moore, Inc., 100 East 42nd St., New York, Monarch Mch. Tool Co., Sidney, O. Morris Mch. Tool Co., Cincinnati. Niles Tool Works Co., Hamilton, O. Porter-Cable Mch. Co., Salina & Wolf Sts., Syracuse, N. Y. Pratt & Whitney Co., Hartford, Conn. Reed-Prentice Corp., Worcester, Mass. Ryerson, Joseph T., & Son, 2558 W. 16th St., Chicago. Schastian Lathe Co., Cincinnati. Seneca Falls Mch. Co., Sidney, O. South Bend Lathe Wks., South Bend.

N. Y. Sidney, M. T., Co., Sidney, O. South Bend Lathe Wks., South Bend. Ind. ind.
Springfield Mch. Tool Co., 631 Southern
Ave., Springfield. O.,
Sundstrand Mch. Tool Co., Rockford, Ill.
Wickes Bros., Saginaw, Mich.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cincinnati Lathe & Tool Co., Oakley, Cincinnati.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Sebastian Lathe Co., Cincinnati.
South Bend Lathe Wks., South Bend, Ind. LATHES, EXTENSION BED & GAP

# LATHES, FOOT POWER

Seneca Falls Mch. Co., Seneca Falls, N. Y.

LATHES, GUN BORING
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Springfield Mch. Tool Co., 631 Southern
Ave., Springfield, O.

# LATHES, PATTERNMAKERS'

Blount, J. G., Co., Central Ave., Everett, Mass. Seneca Falls Mch. Co., Seneca Falls, N. Y. Sa South Bend Lathe Wks., South Bend.

### LATHES, PULLEY

Avey Drilling Mch. Co., Cincinnati.

LATHES, SPEED

Blount, J. G., Co., Central Ave., Everett,
Mass.
Greenfield Tap & Die Corp., Greenfield.
Mass.

### LATHES, SPINNING

LATHES, SPINNING
Adriance Mch. Wks., Inc., 72 Richards
St., Brooklyn, N. Y.
Bliss, E. W., Co., Brooklyn, N. Y.
Toledo Mch. & Tool Co., Toledo, O.
See also Chucking Machines.

LATHES, TURRET
Acme Machine Tool Co., Cincinnati
Bardons & Oliver, Cleveland
Brown & Sharpe Mg. Co., Providence
Bullard Co., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Oakley,
Cincinnati,
Consolidated Mch. Tool Corp. of America
Rochester, N. Y.
Gisholt Machine Co., Madison, Wis.
Greenlee Bros. & Co., Rockford, Ill.
International Mch. Tool Co., Indianapolis, Ind.
Jones & Lamson Mch. Co., Springfield,
Le Blond, R. K., Mch. Tool Co., Cin. Jones & Lamson Mch. Co., Springfield.
Vt.
LeBlond, R. K., Mch. Tool Co., Cincinnatl.
Lodge & Shipley Mch. Tool Co., Cincinnatl.
Morris Mch. Tool Co., Cincinnati.
National Acme Co., Cleveland.
New Britain-Gridley Mch. Co., New
Britain, Conn.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Corp., Brighton.
Boston, Mass.
Springfield Mch. Tool Co., 631 Southern
Ave., Springfield, O.
Stark Tool Co., Waltham, Mass.
Warner & Swasey Co., Cleveland.

LATHES, WOODWORKERS'
Barnes, W. F. & John, Co., Rockford, Blount, J. G., Co., Central Ave., Everett, Mass. Greenfield Tap & Die Corp., Greenfield, Mass.

Pratt & Whitney Co., Hartford, Conn. Starrett, L. S., Co., Athol, Mass. Universal Boring Mch. Co., Hudson, Mass.

### LUBRICANTS

LUBRICANTS
Alemite Corp., 2678 N. Crawford Ave..
Chicago.
Lindsay-McMillan Co., Milwaukee, Wis
Royersford Fdry. & Mch. Co., Box M.
Royersford, Pa.
Sun Oil Co., Philadelphia.

LUBRICATING SYSTEMS

Alemite Corp., 2678 N. Crawford Ave., Chicago.
Bowen Products Corp., Auburn, N. Y. Greene, Tweed & Co., 109 Duane St., New York.

Madison-Kipp Corp., Madison, Wis. Rivett Lathe & Grinder Corp., Brighton. Boston, Mass.
Royersford Fdry. & Mch. Co., Box M. Royersford, Pa.

### MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Drills, Taps, etc.

# MALLETS. RAWHIDE

Chicago Rawhide Mfg. Co., 1302 Elston Ave., Chicago.

# MANDRELS, EXPANDING AND SOLID

See Arbors and Mandrels, Expanding and Solid.

# MARKING MACHINES

MARKING MACHINES
Noble & Westbrook Mfg. Co., Hartford.
Conn.
Preis. H. P., & Co., Inc., 538 South
10th St., Newark, N. J.
V & O Press Co., Hudson, N. Y.

# MEASURING MACHINES, PRECISION

PRECISION
Federal Products Corp., Providence.
Ferner, R. Y., Co., Washington, D. C.
Hanson-Whitney Mch. Co., Hartford, Ct.
Noma-Hoffmann Bearings Co., Stamford,
Conn.
Pratt & Whitney Co., Hartford, Conn.
Scherr, Geo., Co., 144 Liberty St., N. Y.
Van Keuren Co., Watertown, Mass.

# METALLOGRAPHIC EQUIPMENT

Bausch & Lomb Optical Co., 619 St. Paul St., Rochester, N. Y. Scherr, Geo., Co., 144 Liberty St., N. Y.

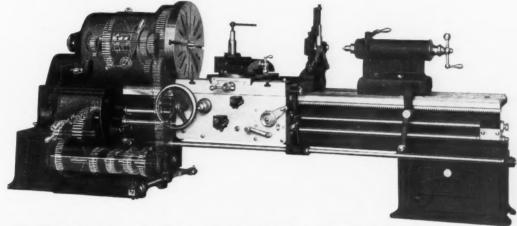
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# BRADFORD LO-DRIVE DESIGN

Chatter-Free Lathes for Speed, Precision, Service

All fast-running, vibration-producing gears are in the base of the Bradford Lo-Drive Lathe—only a few massive, shock-absorbing gears are in the head. Drive vibration is confined *below the spindle* and practically eliminates chatter.

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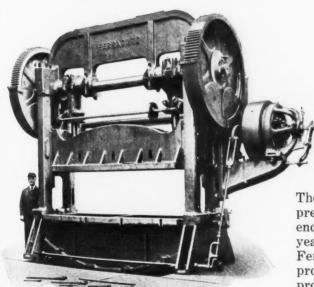
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The Ferracute Double Crank Press S208—capable of exerting 200 tons ram pressure. Tie rod construction with double gearing, friction clutch, motor driven ram adjustment combine to make this a fine example of modern machine tool construction. The distance between columns—124 inches—makes this Ferracute particularly valuable for large, unwieldy work.

The name "Ferracute" has been a password for press quality for 67 years—the valuable experience in the power press field gained during these years of experience is at your service. Call on Ferracute engineers to solve your press work problems; send sketches or samples for cost and production estimates.

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St. Louis, Wm. C. Johnson & Sons Mch. Co. New York, Percy M. Brotherhood & Sons Syracuse, Crane-Schieffer-Owens, Inc. Canada, Canadian Fairbanks-Morse Co., Ltd.

### METALS, BEARING

See Bearing Bronze, Babbitt, etc., and Bushings, Brass, Bronze, etc.

### METALS PERFORATED

Chicago Perforating Co., 2245 W. 24th Place, Chicago.

METERS (See Reading Instruments)

MICROSCOPES, TOOLMAKERS'
Bausch & Lomb Optical Co., 619 St.
Paul St., Rochester, N. Y.
Scherr, Geo., Co., 144 Liberty St., N. Y.

Bath, John, & Co., Inc., Worcester, Mass. Brown & Sharpe Mfg. Co., Providence. Ferner, R. Y., Co., Washington, D. C. Pratt & Whitney Co., Hartford, Conn. Slocomb Co., J. T., Providence, R. I. Starrett, L. S., Co., Athol, Mass. Swedish Gage Co. of America, Detroit-

# MILLING AND DRILLING MACHINES, UPRIGHT

See Drilling and Milling Machines, Vertical.

### **MILLING ATTACHMENTS**

Adams Co., Dubuque, Ia. Brown & Sharpe Mfg. Co., Providence Cincinnati Milling Mch. Co., Oakley,

Cincinnati Works, Inc., Elgin, Ill.
Elgin Tool Works, Inc., Elgin, Ill.
Hendey Machine Co., Torrington, Conn.
Ingersoil Milling Mch. Co., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee.
LeBlond, R. K., Mch. Tool Co., Cincinnati

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custoricin Mch. Co., Cincinnati.

Porter-Cable Mch. Co., Salina & Wolf Sta., Syracuse, N.,

Reed-Prentice Corp., Worcester, Mass. Rivett Lathe & Grinder Corp., Brighton, Boston, Mass. Sundstrand Mch. Tool Co., Rockford, Ill. United States Mch. Tool Co., 1950 W. 6th St., Cincinnati.

Van Norman Mch. Tool Co., Springfield, Mass.

# MILLING MACHINES, AUTOMATIC

Brown & Sharpe Mfg. Co., Providence. Cincinnati Milling Mch. Co., Oakley, Cincinnati.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee,
Wis.

Potter & Johnston Mch. Co., Pawtucket, R. I. Pratt & Whitney Co., Hartford, Conn.

### MILLING MACHINES, BENCH

MILLING MACHINES, BENCH
Ames Co., B. C., Waltham, Mass.
Burke Mch. Tool Co., 516 Sandusky St.,
Conneaut, O.
Hardinge Bros., Inc., 4149 Ravenswood
Ave., Chicago.
Pratt & Whitney Co., Hartford, Conn
Stark Tool Co., Waltham, Mass.
Sundstrand Mch. Tool Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield,
Mass.

# MILLING MACHINES, CIRCULAR CONTINUOUS

Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Gould & Eberhardt, Newark, N. J. Ingersoil Milling Mch. Co., Rockford, Ill. Kearney & Trecker Corp., Milwaukee.

### MILLING MACHINES, DUPLEX

Brown & Sharpe Mfg. Co., Providence. Insersoil Milling Mch. Co., Rockford, Ill. Kearney & Trecker Corp., Milwaukee, Wis. Knight, W. B., Mchry. Co., St. Louis. Niles Tool Works Co., Hamilton, O. Van Norman Mch. Tool Co., Springfield, Mass.

### MILLING MACHINES, HAND

RILLING MACHINES, HAND

Rrown & Sharpe Mg. Co., Providence.

Burke Mch. Tool Co., 516 Sandusky St.,

Conneat, O.

Frew Machine Co., Philadelphia.

Fratt & Whitney Co., Hartford, Conn.

Sundstrand Mch. Tool Co., Rockford, Ill.

United States Mch. Tool Co., 1950 W.

6th St., Cincinnati.

Van Norman Mch. Tool Co., Springfield,

Mass.

# MILLING MACHINES, HORIZONTAL PLAIN

Brown & Sharpe Mfg. Co., Providence Cincinnati Milling Mch. Co., Oakley,

Cincinnati Milling Mch. Co., Oakley, Cincinnati, Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Gallmeyer & Livingston Co., 344 Straight Ave., Grand Rapids, Mich. Hendey Machine Co., Torrington, Conn. Ingersoll Milling Mch. Co., Rockford, Ill. Kearney & Tecker Corp., Milwankee, LeBlond, R. K., Mch. Tool Co., Cincinnati, McCrosky Tool Corp., Meadville, Pa., Niles Tool Works Co., Hamilton, O.

Oesterlein Mch. Co., Cincinnati. Ryerson, Joseph T., & Son, 2558 W. 16th St., Chicago. Sundstrand Mch. Tool Co., Rockford, Ill.

# MILLING MACHINES, HORIZONTAL UNIVERSAL

Brown & Sharpe Mfg. Co., Providence Cincinnati Milling Mch. Co., Oakley, Cincinnati Milling Mch. Co., Oakley, Cincinnati, Gallmeyer & Livingston Co., 344 Straight Ave., Grand Rapids, Mich. Hendey Machine Co., Torrington, Conn. Kearney & Trecker Corp., Milwaukee. LeBlond, R. K., Mch. Tool Co., Cincinnati, McCrosky Tool Corp., Meadville, Pa. Oesterlein Mch. Co., Cincinnati, Preis, H. P., & Co., Inc., 538 South 10th St., Newark, N. J. Rowbottom Mch. Co., Waterbury, Conn. Ryerson, Joseph T., & Son, 2558 W. 16th St., Chicago. Sundstrand Mch. Tool Co., Rockford, Ill. Van Norman Mch. Tool Co., Springfield, Mass.

# MILLING MACHINES, LINCOLN

Brown & Sharpe Mfg. Co., Providence. Hendey Machine Co., Torrington, Conn. Pratt & Whitney Co., Hartford, Conn. Van Norman Mch. Tool Co., Springfield,

# MILLING MACHINES, MULTIPLE SPINDLE

Automatic Mch. Co., Bridgeport, Conn. Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Ingersoll Milling Mch. Co., Rockford, Ill. Kearney & Trecker Corp., Milwaukee. Manning, Maxwell & Moore, Inc., 100 E. 42nd St., New York.
Niles Tool Works Co., Hamilton, O.

MILLING MACHINES, PLANETARY Hall Planetary Co., Philadelphia.

# MILLING MACHINES, PLANER

Ingersoll Milling Mch. Co., Rockford, Ill. Kearney & Trecker Corp., Milwaukee. Wis.

Wis. Manning, Maxwell & Moore, Inc., 100 East 42nd St., New York. Sellers, Wm., & Co., Inc., Philadelphia

# MILLING MACHINES, PORTABLE

Consolidated Mch. Tool Corp. of America, Rochester, N. Y. Pedrick Tool & Mch. Co., 3639 N. Lawrence St., Philadelphia. Underwood, H. B., Corp., Philadelphia.

# MILLING MACHINES, TILTED ROTARY AND OFFSET

Oesterlein Mch. Co., Cincinnati.

# MILLING MACHINES, VERTICAL

Brown & Sharpe Mfg. Co., Providence. Cincinnati Milling Mch. Co., Oakley,

Cincinnati Milling Mch. Co., Oakley,
Cincinnati,
Consolidated Mch. Tool Corp. of America,
Rochester, N. T.
Gorton Mch. Co., Racine, Wis.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee,
Knight, W. B., Mchry, Co., St. Louis,
Niles Tool Works Co., Hamilton, O.
Oesterlein Mch. Co., Cincinnati.
Reed-Prentice Corp., Worcester, Mass.
Van Norman Mch. Tool Co., Springfield,
Mass.

# MILLING TOOLS, HOLLOW ADJUSTABLE

Geometric Tool Co., New Haven, Conn. Modern Tool Works (Consolidated Mch. Tool Corp.) Rochester, N. Y.

# MODEL AND EXPERIMENTAL

See Special Machinery and Tools.

### MOTORS, ELECTRIC

MOTORS, ELECTRIC
Century Electric Co., St. Louis, Mo.
Dumore Co., 25 16th St., Racine, Wis.
General Electric Co., Schenectady, N. Y.
Janette Mig. Co., 556 W. Monroe St.,
Chicago.
Lincoln Electric Co., Cleveland, O.
Roth Bros. & Co., 1400 W. Adams
St., Chicago.
Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mig. Co., East
Pittsburgh, Pa.

NAME PLATES Noble & Westbrook Mfg. Co., Hartford, Conn. Conn.
Pittsburgh Stamp Co., Inc., 810 Canal
St., Pittsburgh, Pa.
Schwerdtle Stamp Co., Bridgeport, Ct.

International Nickel Co., 67 Wall St., New York.

NIPPLE THREADING MACHINERY PIPE CUTTING AND THREADING Bignall & Keeler Mch. Wks., Edwards-ville, Ill. Landis Mch. Co., Inc., Waynesboro, Pa. Merrell Mfg. Co., Toledo, O. Murchey Mch. & Tool Co., 951 Porter St., Detroit. Saunders', D., Sons, Inc., Yonkers, N. Y.

### NUTS, CASTELLATED

National Acme Co., Cleveland.

# NUT SETTING EQUIPMENT

See heading Screw Driving and Nut Setting Equipment.

### **NUT TAPPERS**

See Bolt and Nut Machinery

Veeder-Root, Inc., Hartford, Conn.

# OIL CUPS

Boston Gear Works Sales Co., North Quincy, Mass.
Bowen Products Corp., Auburn, N. Y. Gits Bros., 1911 S. Kilbourn Ave., Chicago.
Tucker, W. W. & C. F., Inc., Hartford, Conn.

Hanna Engineering Wks., 1763 Elston Ave., Chicago. Madison-Kipp Corp., Madison, Wis.

### OILERS, LOOSE PULLEY

Brown Engineering Co., 133 N. Third St., Reading, Pa.

### OIL EXTRACTORS

Barrett, Leon J., Co., 1475 Grafton St., Worcester, Mass. Tolhurst Machine Wks., 645 N. Fulton St., Troy, N. Y.

### OIL GROOVERS

Hanson-Whitney Machine Co., Hartford, Conn. Wicaco Machine Corp., 4803 Stenton Ave., Philadelphia.

### OIL HOLE COVERS

Bowen Products Corp., Auburn, N. Y. Gits Bros., 1911 S. Kilbourn Ave., Chicago. Tucker, W. W. & C. F., Inc., Hartford, Conn.

### OILS, LUBRICATING

Lindsay-McMillan Co., Milwaukee, Wis Standard Oil Co., (Indiana) 910 S. Michigan Ave., Chicago. Sun Oil Co., Philadelphia.

### OILS, QUENCHING & TEMPERING Sun Oil Co., Philadelphia,

# OILS, SOLUBLE

See Compound, Cutting, Grinding, etc.

### OVENS. BAKING

American Gas Furnace Co., Elizabeth, N. J. General Electric Co., Schenectady, N. Y.

PACKING, LEATHER, METAL, RUBBER, ETC. Chicago Rawhide Mfg. Co., 1302 Elston Ave., Chicago.

### PARALLELS

Starrett, L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I. Walker, O. S., Co., Inc., Worcester, Mass.

### PATTERN SHOP MACHINERY

Porter-Cable Mch. Co., Salina & Wolf Sts., Syracuse, N. Y.

# PATTERNS, METAL

Mummert-Dixon Co., Hanover, Pa. V & O Press Co., Hudson, N. Y.

# PATTERNS, WOOD V & O Press Co., Hudson, N. Y.

### PHOSPHOR BRONZE

# PIG IRON

Superior Charcoal Iron Co., Grand Rapids, Mich.

### PINIONS, FORGED

### PIPE BENDING TOOLS

Pedrick Tool & Mch. Co., 3689 N.
Lawrence St., Philadelphia.
Underwood H B. Corp., Philadelphia.

MACHINES
Bignall & Keeler Mch. Whs., Edwardsville, Ill.
Cartis & Curtis Co., 324 Garden St.,
Bridgeport, Conn.,
Foote-Burt Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield,
Mass.
Landis Mch. Co., Inc., Waynesboro, Pa.
Merrell Mfg. Co., Toledo, O.
Murchey Mch. & Tool Co., 951 Porter
St., Detroit.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Saunders', D., Sons, Inc., Yonkers, N. Y.

National Tube Co., Pittsburgh, Pa.

### PLANER ATTACHMENTS

Gray, G. A., Co., Cincinnati, O. Hanson-Whitney Mch. Co., Hartford, Ct.

PLANERS

American Tool Works Co., Cincinnati.
Cincinnati Planer Co., Cincinnati.
Cleveland Planer Co., 3048 Superior
Ave., Cleveland.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Gray, G. A., Co., Cincinnati, O.
Liberty Mch. Tool Co., Hamilton, O.
Manning, Maxwell & Moore, Inc., 100
East 42nd St., New York,
Niles Tool Works Co., Hamilton, O.
Rockford Machine Tool Co., 2412 Kiahwaukee Road, Rockford, III.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Sellers, Wm., & Co., Inc., Philadelphis

PLANERS, CRANK
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.

### PLANERS, OPEN-SIDE

Automatic Mch. Co., Bridgeport, Conn-Cleveland Planer Co., 3048 Superior Ave., Cleveland, Gray, G. A., Co., Cincinnati, O. Liberty Mch. Tool Co., Hamilton, O. Manning, Maxwell & Moore, Inc., 100 East 42nd St., New York.

PLANERS, PORTABLE Underwood, H. B., Corp., Philadelphia.

# PLANERS, ROTARY

PLANERS, ROTARY
Cleveland Punch & Shear Works Co.,
Cleveland, O.
Consolidated Meh. Tool Corp. of America,
Rochester, N. Y.
Niles Tool Works Co., Hamilton, O.
Pedrick Tool & Mch. Co., 3639 N.
Lawrence St., Philadelphia.
Underwood, H. B., Corp., Philadelphia.

# PLATE ROLLS

Cleveland Punch & Shear Works Co., Cleveland, O. Ryerson, Joseph T., & Son, 2558 W 16th St., Chicago. Wickes Bros., Saginaw, Mich.

PLATES, SURFACE
Brown & Sharpe Mfg. Co., Providence.
Jones Mch. Tool Wks., Inc., Philadelphia
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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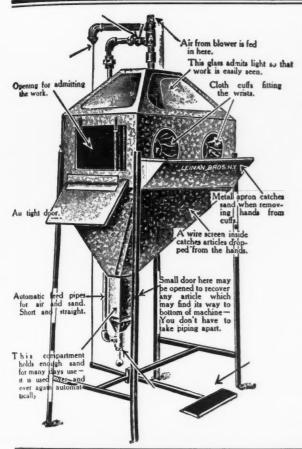
Marquette Tool & Mfg. Co., 6495 W. 65th St., Chicago.

PNEUMATIC EQUIPMENT
Hannifit Mfg. Co., 621-631 S. Kolmar
Ave., Chicago.
Ingersoll-Rand Co., 11 Broadway, N. Y.
Logansport Mch. Co., 529 Market St.,
Logansport, Ind.

# POLISHING LATHES AND MACHINES

Abbott Ball Co., Hartford, Conn.
Automatic Buffing Mch. Co., Buffalo.
Black & Decker Mfg. Co., Towson, Md.
Black & Decker Mfg. Co., Towson, Md.
Bridgeport Safety Emery Wheel Co., Inc.,
1283 W. Broad St., Bridgeport, Ck.
Cincinnati, Electrical Tool Co., Cincin-1283 W. Broad St., Bridgeport, Ck.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Stone Co., Cleveland, O.
Divine Bros. Co., Inc., 106 Whitesboro
St., Utica, N. Y.
Gardner Mch. Co., 414 E. Gardner St.,
Beloit, Wis.
Hammond Mchry. Builders, Inc., 1804
Douglas Ave., Kalamazoo, Mich.
Hartford Steel Ball Co., Hartford, Conn.
Hissy-Wolf Mch. Co., Cincinnati.
New Britain-Gridley Mch. Co., New
Britain, Conn.
Production Equipment Co., Cleveland.

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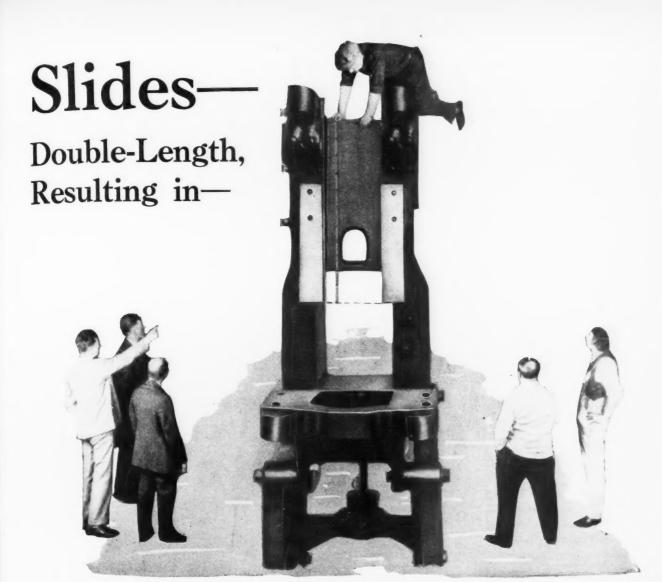
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Clinton St., Chicago. Ill.

SEPARATORS, CENTRIFUGAL Barrett, Leon J., Co., 1475 Grafton St., SEPARATORS, CENTRIFUGAL
Barrett, Leon J., Co., 1475 Grafton St.,
Worcester, Mass.
National Acme Co., Cleveland, O.
Tohurst Machine Wks., 645 N. Fulton
St., Troy, N. Y.
Westinghouse Electric & Mfg. Co., East
Pittsburgh, Pa.

SHAFTING, STEEL
Royersford Fdry. & Mch. Co., Box M,
Royersford, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th
St., Chicago.
Standard Pressed Steel Co., Jenkintown,
Pa. Union Drawn Steel Co., Beaver Falls, Pa.

SHAFTING, STEEL TUBING FOR National Tube Co., Pittsburgh, Pa.

SHAFTS, HOLLOW BORED American Hollow Boring Co., Erie, Pa.

American Tool Works Co., Cincinnati.
Cincinnati Shaper Co., Cincinnati.
Columbia Mch. Tool Co., Hamilton, O.
Gould & Eberhardt, Newark, N. J.
Hendey Machine Co., Torrington, Conn.
Osborne & Sexton Mchry. Co., Columbus, O.
Potter & Johnston Mch. Co., Pawtucket,
R. I.
Rhodes Wife Co. R. I. hodes Mfg. Co., Waltham, Mass. ockford Machine Tool Co., 2412 Kish-waukee Road, Rockford, Ill. yerson, Jos. T., & Son, 2558 W. 16th Ryers Ryerson, Jos. T., & Son, 2558 W. 16th st., Chicago. Smith & Mills Co., Cincinnati, O. Springfield Mch. Tool Co., 631 Southern Ave., Springfield, O. Western Mch. Tool Wks., Holland, Mich.

SHAPERS, PORTABL Reed-Prentice Corp., V

SHAPERS, VERTICAL Hanson-Whitney Mch. Co., Hartford. Pratt & Whitney Co., Hartford, Conn. Rhodes Mfg. Co., Waltham, Mass.

SHAPES, STRUCTURAL Aluminum Co. of America, 2437 Oliver Bldg., Pittsburgh, Pa. Carnegie Steel Co., Pittsburgh, Pa.

SHEARING MACHINERY
Buffalo Forge Co., Buffalo, N. Y.
Canton Fdry. & Mch. Co., Canton, O.
Cleveland Punch & Shear Works Co.,
Cleveland.
Consolidated Mch. Tool Corp. of America,
Rochester, N. Y.
Ferracute Mch. Co., Bridgeton, N. J.
Manning Maxwell & Moore, Inc., 100
East 42nd St., New York,
New Albany Mch. Mfg. Co., New Albany,
Ind.

Niagara Mch. & Tool Wks., Buffalo. Peck, Stow & Wilcox Co., Southington, Conn.
Royersford, Pa.
Royersford, Pa.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Watson-Stillman Co., 73 West St., N. I.
Wickes Bros., Saginaw, Mich.

SHEARING MACHINERY, HAND New Albany Mch. Mfg. Co., New Albany, Ind. Ind. Siagara Mch. & Tool Wks., Buffalo. eek, Stow & Wilcox Co., Southington, Conn. icker, W. W. & C. F., Inc., Hartford, Conn.

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Bliss, E. W., Co., Brooklyn, N. Y.
Niagara Mch. & Tool Wks., Buffalo.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Toledo Mch. & Tool Co., Toledo, O.
Union Twist Drill Co., Athol, Mass.

SHEARS, SQUARING Cleveland Punch & Shear Works Co., Cleveland, O. New Albany Mch. Mfg. Co., New Albany, Ind. Niagara Mch. & Tool Wks., Buffalo. Peck, Stow & Wilcox Co., Southington, Conn.
Toledo Mch. & Tool Co., Toledo, O.

SHEAVE WHEELS Link Belt Co., Chicago, Ill. Wood's, T. B., & Sons Co., Chambers-burg, Pa.

SHEET METALS
Aluminum Co. of America, 2437 Oliver
Bldg., Pittsburgh. Pa.
American Sheet & Tin Plate Co., Frick
Bldg., Pittsburgh. Pa.
New Jersey Zinc Co., 160 Front St.,
New York.
Ryerson, Jos. T., & Son, 2558 W. 16th
St., Chicago.

SHEET METAL WORK
Aluminum Co. of America, 2437 Oliver
Bldg., Pittsburgh, Pa.
American Pulley Co., Philadelphia.
New Britain-Gridley Mch. Co., New
Britain, Comn.

SHELVING Furniture, Shop. SHERARDIZING, ELECTRIC General Electric Co., Schenectad

Schenectady, N. Y.

SLEEVES
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, Inc., Detroit, Mich.

SLIDE RULES Pease, C. F., Co., 822 No. Franklin St., Chicago, Ill.

SLOTTERS, PORTABLE Consolidated Mch. Tool Corp. of America, Rochester, N. Y.

SLOTTING MACHINES Baker Bros., Inc., Toledo, O.
Consolidated Machine Tool Corporation
of America, Rochester, N. Y.
Jones Mch. Tool Wks., Inc., Philadelphia, Pa.
Nazel Procession. Jones Mch. Tool Wks., Inc., Philadel-phia, Pa. Nazel Engineering Co. & Mch. Wks., 4043 N. 5th St., Philadelphia. Rhodes Mfg. Co. Watham. Mass. Sellers, Wm., & Co., Inc., Philadelphia. Wks.,

SOCKETS
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield,
Mass.
Morse Twist Drill & Mch. Co., New
Bedford. Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, Inc., Detroit, Mich.
Williams, J. H., & Co., Buffalo, N. Y. SOCKETS

SPECIAL MACHINERY AND TOOLS Automatic Mch. Co., Bridgeport, Conn.
Baird Mch. Co., Bridgeport, Conn.
Bantam Ball Bearing Co., South Bend,
Ind.
Barnes, W. F. & John, Co., Rockford,
Ill. Barnes, W. F. & John, Co., Rockford, Ill. Bilgram Mch. Wks., 1281 Spring Garden St., Philadelphia. Blanchard Mch. Co., 64 State St., Cambridge, Mass. Bliss, E. W., Co., Brooklyn, N. Y. City Mch. & Tool Cwist, Dayton, O. Cleveland Auto. Mch. Co., Cleveland. Columbia Mch. Tool Co., Hamilton, O. Columbias Die, Tool & Mch. Co., Columbis, O. Consolidated Machine Tool Corporation of America, Rochester, N. Y. Earle Gear & Mch. Co., 4709 Stenton Ave., Philadelphia. Elgin Tool Works, Inc., 1812; Woodhill Rd., Cleveland. Gisholt Machine Co., Madison, Wis.

# "Easy, Pop-

He's an intimate of my friend here, 'Arc Welding'.

Fact is every man in the Lincoln organization is a similar 'crank' and for very good reason.

During working hours everyone from the 'card please' boy at the front door to the welder bouncer on the shipping platform, all they see is arc welding.

All they read is matter on arc welding.

All they study is arc welding.

All they *hear* at company meetings or in business conduct is arc welding.

All they teach at the Lincoln school is arc welding.

When they *talk* shop it must be on arc welding because that's all that happens in the shop.

And because they're that kind of 'cranks' due to strict specialization, more is naturally expected of their welders than if their production was varied.

It's significant to note, Pop, that 87% of the statues in the world have been erected to men who were once called 'cranks' on specialized subjects."

# "Here, Lad \_

I've just been talking to that man you sent in from Lincoln Electric Company.

He certainly is a crank on the subject of arc welding. How does he get that way?"



**TRADITION** 

# The Lincoln "Stable-Arc" Welder

— welds easier

- makes better welds

permits greater output because of the steady uniform arc throughout entire welding range, which is the result of:

Variable voltage design

Laminated magnetic circuit

Separately-excited generator field

Double control of welding heat

All steel construction

No other welder has all these features.



The Lincoln Electric Co., Dept. No., 7-8, Cleveland, O.

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Nagara Mch. & Tool Wks., Buffalo. Peck, Stow & Wilcox Co., Southington, Conn.
Precision Engineering Co., Philadelphia. Reed-Prentice Corp., Worcester, Mass. Rockford Machine Tool Co., 2412 Kishwankee Road, Rockford. Ill. Ruthman Mch. Co., Cincinnati, O. S. & S. Mch. Wks., 4541 W. Lake St., Chicago.
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Chicago.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Mch. Co., Dept. 37,
111 N. Canal St., Chicago.
Grant Gear Works, Inc., Boston, Mass.
Horsburgh & Scott Co., Cleveland,
Janette Mfg. Co., 556 W. Monroe St.,
Chicago

Janette Mig. Co., Joseph Chicago, Ill.
Line, W. C., Inc., Syracuse. N. Y.
Philadelphia Gear Works, Philadelphia
Shepard Niles Crane & Hoist Corp., 380
Schuyler Ave. Montour Falls, N. Y.
Smith, Winfield H., Inc., 116 Eaton St.,
Springville, N. Y.

SPINDLES, GRINDING Ex-Cell-O Aircraft & Tool Corp., Detroit.

SPINDLES, HOLLOW BORED American Hollow Boring Co., Erie, Pa

SPINNING LATHES See Lathes, Spinning.

SPRING COILING AND FORMING MACHINERY Baird Mch. Co., Bridgeport, Conn. Hjorth Lathe & Tool Co., Boston, Mass.

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BPROCKET CHAIMS

Baldwin-Duckworth Chain Corp., Worcester, Mass., and Springfield, Mass.
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Grant Gear Works, Inc., Boston, Mass.
Link Belt Co., Chicago, III.
Morse Chain Co., Ithaca, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Philadelphia Gear Works, Philadelphia.
Ramsey Chain Co., Inc., Albany, N. Y.
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Grant Gear Works. Inc., Boston, Mass.
Hartford Special Mchy. Co., Hartford.
Link Belt Co., Chicago, Ill.
Massachusetts Gear & Tool Co., 34
Nashus St., Woburn. Mass.
Meisel Press Mfg. Co., 948 Dorchester
Ave., Boston 25, Mass.
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Newark Gear Cutting Mch. Co., Newark,
N. J.
Philadelphia Gear Works. N. J. Philadelphia Gear Works, Philadelphia Whitney Mfg. Co., Hartford, Conn.

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St., Pittsburgh, Pa.
Schwerdtle Stamp Co., Bridgeport, Conn.

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Carnegie Steel Co., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston, Mass.
Ludlum Steel Co., Watervliet, N. Y.
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16th St., Chicago.
Simonds Saw & Steel Co., Fitchburg,
Mass. 16th St., Chicago. Simonds Saw & Steel Co., Fitchburg, Muss. Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL ALLOYS

See Alloys, Steel Tungsten, etc.

STEEL, COLD DRAWN

Ryerson, Joseph T., & Son, 2558 W. 16th St., Chicago. Union Drawn Steel Co., Beaver Falls, Pa.

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Allen, Edgar, Steel Co., Inc., 741 Washington St. N. Y. Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago. Boker, H., & Co., Inc., 103 Duane St., New York. w York egie Steel Co., Pittsburgh, Pa. enter Steel Co., Reading, Pa. enter Steel Co., Reading, Pa. enter Steel Co., Pittsburgh, Pa. enter Steel Co., McKeesport, Pa. kridge Bros. Co., Boston, Mass. um Steel Co., Watervliet, N. Y. son, Joseph T., & Son. 2558 W. 8th St. Chicago. Colonial
Firth-Sterling Stee
Hawkridge Bros. Co., Brown
Hawkridge Bros. Co., Watervliet,
Ludlum Steel Co., Watervliet,
Ryerson, Joseph T., & Son. 2558 v.
16th St., Chicago.
Simonds Saw & Steel Co., Fitchburg,

\*\*Tags.

\*\*Tags.

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Colonial Steel Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston, Mass.
Ryerson, Joseph T., & Son, 2558 W.
16th St., Chicago.
Timken Roller Bearing Co., Canton, O.
Timken Roller Bearing Co., Canton, O.
Tinion Drawn Steel Co., Beaver Falls, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.

Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL. RUSTLESS

Carpenter Steel Co., Reading, Pa. Firth-Sterling Steel Co., McKeesport, Pa Ludlum Steel Co., Watervliet, N. Y.

STEEL, STAINLESS

Carpenter Steel Co., Reading, Pa. Firth-Sterling Steel Co., McKeesport, Pa.

STEEL, STRIP AND SHEET American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa.

STELLITE

Haynes Stellite Co., Kokomo, Ind.

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Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass. Curtis & Curtis Co., 324 Garden St., Bridgeport, Conn. Greenfield Tap & Die Corp., Greenfield, Mass. Mass.
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Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn
Saunders', D., Sons, Inc., Yonkers, N. Y.

STONES, OIL

Carborundum Co., Niagara Falls, N. Y. Norton Co., Worcester, Mass. STOOLS AND CHAIRS, STEEL

See Furniture, Shop and Drafting-Room STRAIGHTENING MACHINERY

STRAIGHTENING MACHINERY
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Morse Twist Drill & Mch. Co., New
Bedford, Mass.
Oilgear Co., 660 Park St. Milwaukee,
Shuster, F. B., Co., New Haven, Conn.
Springfield Mch. Tool Co., 631 Southern
Ave., Springfield, O.

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STUD SETTERS, OPENING
Consolidated Machine Tool Corporation
of America, Rochester, N. Y.
Errington Mechanical Laboratory, 200
Broadway, New York.
Geometric Tool Co., New Haven, Conn.
Procunier Safety Chuck Co., 20 S.
Clinton St., Chicago.

SUB PRESSES

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U. S. Tool Co., Inc., Ampere, N. J.

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Etna Machine Co., Toledo, O. Langelier Mfg. Co., Providence, R. I. Torrington Co., Torrington, Conn.

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SWITCHES
Allen-Bradley Co., 499 Clinton St.,
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Bristol Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Shepard Niles Crane & Hoist Corp., 389
Schuyler Ave., Montour Falls, N. Y.
Westinghouse Electric & Mfg. Co., East
Pittsburgh, Pa.

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Bristol Co., Waterbury, Conn. Leeds & Northrup Co., Philadelphia. Scherr, Geo., Co., 144 Liberty St., N. Y. Veeder-Root, Inc., Hartford, Conn. Zernickow, O., Co., 21 Park Row, N. Y.

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Allen Mfg. Co., 125 Shelton St., Hartford, Conn.

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Walton Co., Hartford. Conn.

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National Auto. Tool Co., Richmond, Ind.
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Rarber-Colman Co., Rockford, Ill.
Barnes, W. F. & John, Co., Rockford.
Ill. innati Bickford Tool Co., Oakley

Ill.
Cincinnati Bickford Tool Co., Oakley.
Cincinnati.
Consolidated Machine Tool Corporation
of America, Rochester, N. Y.
Etteo Tool Co., Inc., 600 Johnson Ave.,
Brooklyn, N. Y.
Errington Mechanical Laboratory, 200
Broadway, New York
Geometric Tool Co., New Haven, Conn.
Hoefer Mfg. Co., Freenort, Ill.
Langelier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Wordester, Mass.,
McCrosky Tool Corp., Meadville, Pn
Modern Tool Works (Consolidated Mch.
Tool Corp.) Rochester, N. Y.
National Auto, Tool Co., Richmond, Ind.
Procunier Safety Chuck Co., 20 S.
Clinton St., Chicago.
Western Mch. Tool Wks., Holland, Mich.

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TAPPING MACHINES

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Barnes, W. F. & John, Co., Rockford, Ill.

Brafford Mch. Tool Co., Cincinnati.

Burke Mch. Tool Co., 516 Sandusky St., Conneaut, O.

Defiance Machine Co., Defiance, O.

Elgin Tool Works, Inc. Elgin, Ill.

Frew Machine Co., Philadelphia.

Geometric Tool Co., New Haven, Conn.

Greenlee Bros. & Co., Rockford, Ill.

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Langeller Mfg. Co., Providence, R. I.

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Moline Tool Co., Moline, Ill.

Murchey Mch. & Tool Co., 951 Porter

St., Detroit.

National Auto. Tool Co., Richmond, Ind.

National Audo. Tool Co., Richmond, Ind.

National Audo.

Sturcney Mch. & Tool Co., 951 Porter St., Detroit. National Auto. Tool Co., Richmond, Ind. National Machinery Co., Tiffin, O. Procunier Safety Chuck Co., 20 S. Clinton St., Chicago. Rockford Drilling Mch. Co., Rockford, Ill.

Ill.
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Bath. John & Co., Inc., Worcester, Mass Brubaker, W. L., & Bros. Co., 50 Church St., New York. Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass, Geometric Tool Co., New Haven, Conn Greenfield Tap & Die Corp., Greenfield. Mass.

Twist Drill Co., Mansfield, Mass.
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Greenfield.
Hanson-Whitney Mch. Co., Hartford
Hardinge Bros., Inc., 4149 Ravenswood
Ave., Chicago.
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Morse Twist Drill & Mch. Co., New
Bedford, Mass.
National Acme Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn
Reiff & Nestor Co., Lykens, Pa.
Saunders', D., Sons, Inc., Yonkers, N. Y
Standard Tool Co., Cleveland, O.
Winter Bros. Co., Wrentham, Mass.

TAPS, COLLAPSING

TAPS. COLLAPSING
Errington Mechanical Laboratory, 2001
Bradway, New York.
Geometric Tool Co., New Haven. ConnLandis Mch. Co., Inc., Waynesboro, Pa
Modern Tool Co., (Consolidated Meh
Tool Corp.) Rochester, N. Y.
Murchey Mch. & Tool Co., 951 Porter
St., Detroit.
National Acme Co., Cleveland.

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THREAD CUTTING MACHINERY
Acme Machinery Co., Cleveland,
Automatic Meh. Co., Bridgenort, Conn.
Brown & Sharpe Mfg. Co., Providence
Eastern Mch. Screw Corp., New Haven.
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Ferner, R. Y., Co., Washington, D. C.
Geometric Tool Co., New Haven. Conn.
Grant Mfg. & Mch. Co., N. W. Station.
Bridgeport, Conn.
Hall Planetary Co., Philadelphia
H & G Wks., Eastern Mch. Screw Corp.
New Haven. Conn.
Landis Mch. Co., Inc., Waynesboro, Pa
Modern Tool Works (Consolidated Mch.
Tool Corp.) Rochester, N. Y.
Murchey Mch. & Tool Co., 951 Porter
St., Detroit.
National Machinery Co., Tiffin, O.

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THREAD GAGES See Gages, Thread.

THREAD MEASURING WIRES Van Keuren Co., Watertown, Mas

THREAD MILLING MACHINES THREAD MILLING MACHINES
Adams Co., Dubuque, Ia.
Consolidated Mch. Tool Corp. of America.
Rochester, N. Y.
Hall Planetary Co., Philadelphia.
Hanson-Whitney Mfg. Co., Hartford, Conn.
Scherr, Geo., Co., 144 Liberty St., N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mch. Wks., Waltham, Mass
Zernickow, O., Co., 21 Park Row, N. Y.

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V & O Press Co., Hudson N. Y.

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Bldg., Pittsburgh, Pa.

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TOOL CASES Gerstner & Sons, H., Dayton, O Starrett, L. S., Co., Athol, Mass

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Barber-Colman Co., Rockford, Ill.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Illinois Tool Wks., 2501 N Keeler Ave.,
Chicago.

Illinois Tool Wks., 2561 N Keeler Ave., Chicago.
Chicago.
Chicago.
Ludium Steel Co., Waterrliet, N. Y.
Ryerson, Joseph T., & Son. 2558 W.
16th St., Chicago.
Vanadium Alloys Steel Co. Latrobe, Pa.
Williams, J. H., & Co., Buffalo, N. Y.

TOOL HOLDERS

Armstrong Bros. Tool Co., 313 N. Francisco Ave. Chicago.
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Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., Kokomo, Ind.
Loveioy Tool Co., Inc., Springfield, Vt.
O. K. Tool Co., Inc., Shetton, Conn.
Osgood, J. L., Mchy, & Tool Co., Inc.
Bnffalo, N. Y.
Ready Tool Co., Bridgeport. Conn.
Williams, J. H., & Co., Buffalo, N. Y. TOOL HOLDERS

TOOLS, LATHE, SHAPER AND PLANER

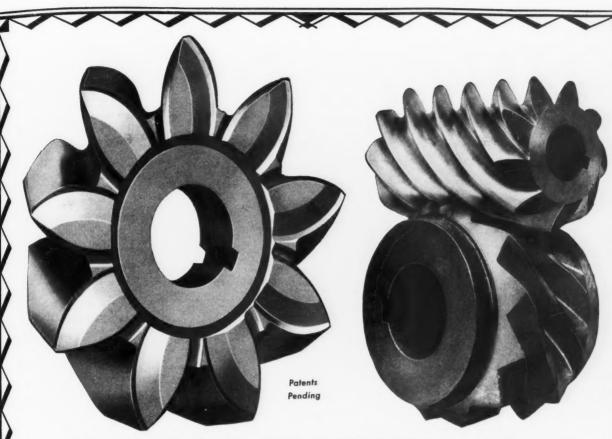
PLANER
Armstrong Bros., Tool Co., 313 N. Francisco Ave., Chicago.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Wks., 2501 N. Keeler Ave.,
Chicago.
Lovejoy Tool Co., Inc., Springfield, Vt.
O, K. Tool Co., Inc., Shelton, Conn.
Ready Tool Co., Bridgeport, Conn.
Schastlan Lathe Co., Cincinnati.
Williams, J. H., & Co., Buffalo, N. Y.

TOOLS, STELLITE WELDED TIP Haynes Stellite Co., Kokomo, Ind.

TRACING FILING CABINETS Cabinets, Filing.

TRANSMISSION MACHINERY See Hangers, Shafting, Pulleys, Clutches, Couplings, Belting, Chains, etc.

ALPHABETICAL INDEX OF ADVERTISERS, PAGES 297-298



On June 1st, 1930, The National-Cleveland UNIVERSAL Gear Shaper was announced to industry as the first Gear Shaper capable of cutting spur gears, right and left hand helical gears and internal gears with the same straight tooth UNIVERSAL Gear Shaper Cutter, on a standard machine with standard equipment.

The exclusive advantages and versatility of the UNIVERSAL Gear Shaper are now further emphasized with the announcement that it may be used to cut multiple threaded worms and worm wheels of low ratio and high helix angle, using the same cutter.

With the addition of an extra slide turret base, helical guides and one helical cutter, the only extra equipment necessary, the cylindrical multiple threaded worm and the hour-glass worm wheel, shown in upper right, may be generated with the same UNIVERSAL Gear Shaper Cutter of the helical type, as illustrated upper left.

This is just one example of many that may be handled to advantage on the UNI-VERSAL Gear Shaper. Complete data is available in our UNIVERSAL Gear Shaper Bulletin, which will be mailed on request.

# National-Cleveland

Quality Products

UNIVERSAL Gear Shaper Cutters Gear and Milling Cutters Hobs, Special Tools

UNIVERSAL Gear Shaper Spur and Gear Grinding Machines Gear Testing Machines

# THE NATIONAL TOOL COMPANY

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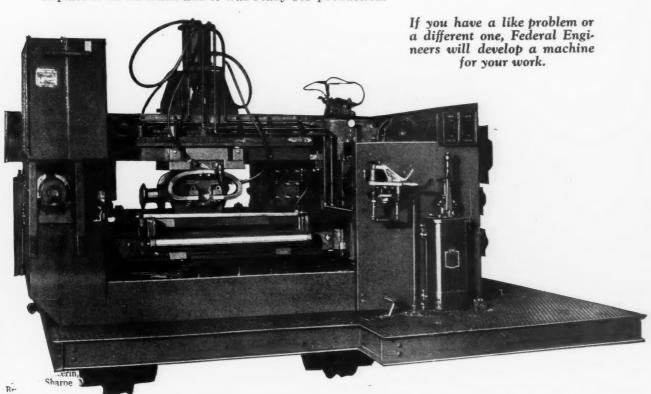
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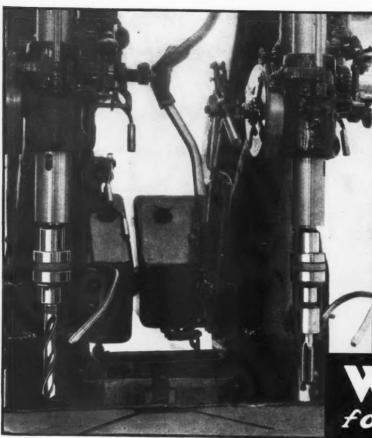
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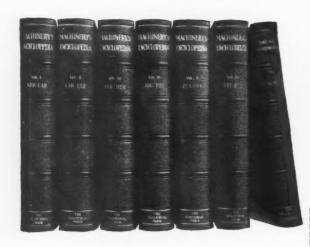
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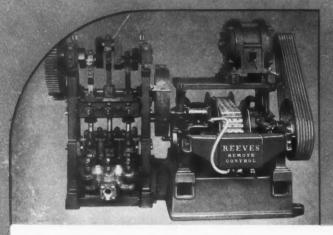
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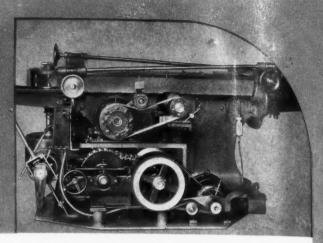
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